NUCLEAR SCIENCE ABSTRACTS

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GENERAL

ATOMIC BOMBS AND WARFARE

7040 WT-1169
Division of Biology and Medicine, AEC and Los Alamos Scientific Lab., N. Mex.
TECHNICAL PHOTOGRAPHY, DOCUMENTARY. S. A. Anthony and Robert Crook. June 1956. 34p. Project 39.4a [of] OPERATION TEAPOT. $0.30(OTS).

Procedures were developed for the more effective utilization of men, equipment, and available time to meet the requirements of project officers for documentary photographs during Teapot Operation. These procedures are discussed and illustrated. (C.H.)

7041 AEC-tr-2922
ATOMIC WEAPON. V. A. Mesentsev. Translation of Chap. III, p.74-107 in The Atom and Atomic Energy (Atom I Atomnaya Energiya), Military Publishing House, Ministry of Defense, U.S.S.R., (Moscow), 1955. 36p. (F-TS-8777/V).

7042
SEISMOLOGICAL AND RELATED ASPECTS OF THE 1954 HYDROGEN BOMB EXPLOSIONS. T. N. Burke-Gaffney (Riverview Coll. Observatory, N. S. W.) and K. E. Bullen (Univ. of Sidney). Australian J. Phys. 10, 130-6(1957) Mar.

Seismic data, recorded in the regular way, from four American hydrogen bomb explosions of 1954, indicate that the origin-times of the explosions were, in G.M.T.: (i) Feb. 28 days 18 hr 45 min 0 sec, (ii) Mar. 26 days 18 hr 30 min 0 sec, (iii) Apr. 25 days 18 hr 10 min 0 sec, (iv) May 4 days 18 hr 10 min 0 sec. If these surmised times are correct, and if the assumed source-point is correct, the results show that the seismic travel-times from Bikini in all azimuths need reductions of the order of 1–2 sec (possibly more) from the standard travel-times. The analysis focuses attention on the great value atomic explosions can have in advancing knowledge of the Earth's interior when precise details of origin-times and source-points are released. The analysis is also applied to observations by Yamamoto of air waves from the explosions. It is shown that there is no seasonal effect on the mean air velocities as suggested by Yamamoto. Also discrepancies which appeared in Yamamoto's work between the velocities for these shocks on the one hand, and the Krakatoa eruption of 1883 and the fall of the Siberian meteor of 1908 on the other hand, are removed. (auth)

Refer also to abstract 7065.

ATOMIC POWER

7043 AERE-Inf/Bib-97(2nd. ed.)
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
THE UNITED KINGDOM ATOMIC POWER PROGRAMME. A SELECTED READING LIST. Mar. 1957. 5p.

A first revision of AERE-Inf/Bib-97 issued in March 1956.

7044
THERMONUCLEAR POWER: A THEORETICAL INTRODUCTION. W. B. Thompson (Atomic Energy Research Establishment, Harwell, Berks). Nature 179, 886-9(1957) May 4.

RESEARCH PROGRAMS

7045 BNL-426
Brookhaven National Lab., Upton, N. Y.
ANNUAL REPORT — JULY 1, 1956. 150p. Contract AT-30-2-GEN-16. $0.75(OTS).

The progress and trends of the research program of the Brookhaven National Laboratory are presented along with a description of the operational, service, and administrative activities. The activities of the laboratory service organization are reported in detail whereas research activities are covered only in summary, since the details are covered more fully in scientific and technical periodicals and reports. (For previous report see BNL-364.) (M.H.R.)

BIOLOGY AND MEDICINE

7046 HW-43060
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
NO_2 EXPOSURES FROM OPERATIONS IN THE 224 U BUILDING. W. E. Gill. May 15, 1956. 12p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The problem of air contamination by NO_2, HNO_3, and UO_3 from the calcination pots in building 224 U is surveyed. The recommendations for remedying the situation are given. (T.R.H.)

7047
SOME DISTANCE EFFECTS PRODUCED BY A PHOTODYNAMIC SHOCK ON SMALL LABORATORY ANIMALS. Frederic Ludwig. Intern. J. Appl. Radiation Isotopes 2, 44-51(1957) Apr.

RADIATION EFFECTS

7048 AFPTRC-TN-57-19
Personnel and Training Research Center. Personnel Lab., Lackland AFB, Tex.
METHODS OF REDUCTION OF PSYCHOLOGICAL STRESS DUE TO RADIATION. Robert G. Smith, Jr. and John A. Cox, Jr. Feb. 4, 1957. 14p. Project 7734. (AD-098922).

7049
COMPARATIVE BIOLOGIC EFFECT OF 30 MeV_P AND 220 kV_P ROENTGEN RAYS AND 0.4 MeV GAMMA RAYS AT 8–9°C. K. C. Bora (Indian Cancer Research Centre, Bombay). Acta Radiol. 47, 321-6(1957) Apr.

7050
MODIFICATION OF THE RELEASE OF CELLULAR CONSTITUENTS BY IRRADIATED ESCHERICHIA COLI. Daniel Billen (Oak Ridge National Lab., Tenn.). Arch. Biochem. Biophys. 67, 333-40(1957) Apr.

7051
PULMONARY EFFECTS FROM RADIOACTIVE THALLIUM-ACTIVATED CLAY PARTICLES. H. Cember, J. A. Watson, and T. B. Grucci. Arch. Ind. Health 15, 449-50 (1957) May.

7052

THE EFFECT OF X-RADIATION IN VIVO ON PROTEIN AND NUCLEOPROTEIN METABOLISM IN THE RAT. J. E. Richmond, Margery G. Ord, and L. A. Stocken (Univ. of Oxford). Biochem. J. (London) 66, 123-7(1957) May.

7053

COMPARISON OF THE SKIN AND DEPILATORY REACTIONS PRODUCED IN THE LEGS OF MICE BY 2000 r OF 200 kv AND 2 Mev X RAYS. C. W. Wilson (Westminister Hospital, London). Brit. J. Radiol. 30, 269-70(1957) May.

7054

SOME MICROBIOLOGICAL ASPECTS OF RADIATION STERILIZATION. George J. Fuld, Bernard E. Proctor, and Samuel A. Goldblith (Massachusetts Inst. of Tech., Cambridge). Intern. J. Appl. Radiation Isotopes 2, 35-43 (1957) Apr.

7055

ON THE PROCESSES OF ORGANISM ACCUMULATION AND EXCRETION OF RADIOISOTOPES OF ALKALI EARTHS, RARE EARTHS, AND HEAVY ELEMENTS. G. E. Fradkin. Med. Radiol. 2, No. 2, 13-8(1957) Mar.–Apr. (In Russian)

A report is made on effects of radioactive elements of Th, Po, Sr, Ba, Y, Ce, and Pu interactions with tissue formations and metabolic products in animal organisms. (R.V.J.)

7056

CYTOLOGICAL REACTIONS OF BLOOD AND ORGANS IN IRRADIATED ANIMALS. N. N. Klemparskaya. Med. Radiol. 2, No. 2, 18-26(1957) Mar.–Apr. (In Russian)

7057

RADIOINDUCED OLEFACTORY DISTURBANCES IN PEOPLE. L. B. Koznova. Med. Radiol. 2, No. 2, 26-30(1957) Mar.–Apr. (In Russian)

7058

ON THE FINAL PERIOD IN THE ACUTE RADIATION SICKNESS. G. V. Bavro. Med. Radiol. 2, No. 2, 31-41 (1957) Mar.–Apr. (In Russian)

7059

CONTENT OF STEROID HORMONES IN SUPRARENAL BLOOD OF IRRADIATED RABBITS. L. V. Orlova and V. M. Rodionov. (Inst. of Biological and Medical Chemistry, Acad. of Medical Sciences U.S.S.R.). Med. Radiol. 2, No. 2, 54-9(1957) Mar.–Apr. (In Russian)

7060

REGENERATION OF PASSIVE IMMUNITY IN IRRADIATED ANIMALS. D. R. Kaulen (Gamaleĭ Inst. of Epidemology and Microbiology, Acad. of Medical Sciences U.S.S.R.). Med. Radiol. 2, No. 2, 65-70(1957) Mar.–Apr. (In Russian)

7061

RETICULOCYTIC CRISIS IN THE NEWBORN RAT AFTER X-IRRADIATION. S. Hajdukovic and Lj. Stosic (Boris Kidrich Inst. for Nuclear Sciences, Belgrade). Nature 179, 821-2(1957) Apr. 20.

7062

EFFECT OF RADIOACTIVE COLLOIDAL GOLD ON THE MAST CELLS OF BONE MARROW. J. P. Guimaraes (Instituto Oswaldo Cruz, D. Federal, Brazil) and D. M. Taylor (Royal Cancer Hospital, London). Nature 179, 914 (1957) May 4.

7063

MITOTIC DELAY INDUCED BY GAMMA RADIATION IN BROAD BEAN ROOT MERISTEMS. G. J. Neary, H. J. Evans, and S. M. Tonkinson (Atomic Energy Research Establishment, Harwell, Berks). Nature 179, 917-18(1957) May 4.

7064

LEUKEMIA AND IONIZING RADIATION. E. B. Lewis (California Inst. of Tech., Pasadena). Science 125, 965-71 (1957) May 17.

Leukemia in man can be induced by ionizing radiations and also occurs spontaneously. For the average individual in a population, the probability of developing radiation-induced leukemia is estimated to be 2×10^{-6} per rad (unit of absorbed dose of radiation) per year. The available data from four independent sources make it likely that this estimate is valid within a factor of about 3, giving a range from 0.7×10^{-6} to 6×10^{-6} per rad per year. It is pointed out that 10 to 20 percent of the spontaneous incidence of leukemia may result from radiation from natural background sources. It is estimated that a 5- to 10-percent increase in the current spontaneous incidence of leukemia would occur if the population were to reach and maintain a body level of Sr^{90} amounting to one-tenth of the maximum permissible concentration. (auth)

RADIATION HAZARDS AND PROTECTION

7065 AD-95491

Massachusetts Inst. of Tech., Cambridge. Fuels Research Lab.

SURFACE TEMPERATURES IN A TWO-LAYER AIR-SPACED SLAB SYSTEM IRRADIATED FROM ONE SIDE. Technical Report No. 4. E. Ho Leong and M. E. Williams. Jan. 30, 1956. 65p. Project DIC 6797. Contract N5-ori-07851. (AFSWP-206716).

In order to study protection of human skin by clothing when exposed to high-intensity radiant heat fluxes liberated by an atomic explosion, a mathematical analysis has been carried out for unsteady state heat conduction through a simple two layer system. Experiments were designed to determine whether the model of cotton sateen over a polyethylene block was amenable to this analysis. This simple treatment was found inadequate to describe the heat transfer process through the model described, which apparently is complicated by the presence of moisture in the cloth. The light fabrics gave better protection from radiation damage than dark ones, over the first two seconds after exposure. Results are graphed and tabulated. (M.H.R.)

7066 AERE-C/R-2165(App.)

United Kingdom Atomic Energy Authority. Research Group. Chemistry Div., Woolwich Outstation, England.

THE DETERMINATION OF LONG-LIVED FALL OUT IN RAIN-WATER. R. G. Osmond, A. G. Pratchett, and J. B. Warricker. Feb. 1957. 9p.

7067 AERE-I/M-43

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A SELECTED READING LIST ON RADIOLOGICAL PROTECTION AND LABORATORY DESIGN. (References selected from literature published between 1946 and 1956). R. J. Millett, comp. Apr. 1957. 5p.

7068 HW-43099

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

REDUCTION OF AIR BORNE CONTAMINATION — UO_3 PLANT. W. P. Ingalls and Kenneth L. Sanborn. May 11, 1956. 16p. Contract [W-31-109-Eng-52]. $3.30 (ph OTS); $2.40 (mf OTS).

Scope and design criteria are given for improvements to the UO_3 Plant electric pot agitation, electric pot covers, and the HNO_3 off-gas system which should reduce airborne contamination. (T.R.H.)

7069 UCLA-388

California. Univ., Los Angeles. Atomic Energy Project. THE EFFECT OF PACIFIC WEAPONS TESTING ON BACKGROUND ACTIVITIES IN THE STATE OF CALIFORNIA. L. Baurmash, J. W. Neel, and R. F. Butts. May 14, 1957. 33p. Contract AT-04-1-GEN-12. $6.30(ph OTS); $3.00(mf OTS).

Air and fall-out sampling stations were established at Redding, Davis, Fresno, Los Angeles, and San Diego, California during the month of April, 1956 and operated through August 31, 1956. Daily air radioactivity concentrations and fall-out levels, measured approximately three days after each sample was completed, are presented in tabular and graphic form. Three major increases in air concentrations were noted in California during the following time periods: June 8 to 13, July 4 to 12, and July 22 to 30. The maximum daily concentrations detected at each station ranged from 4.15 $\mu\mu c/M^3$ at San Diego to 11.63 $\mu\mu c/M^3$ at Redding. Daily fall-out levels at individual stations were highly variable; the maxima ranged from 457.27 $\mu\mu c/ft^2$ at San Diego to 1,033.17 $\mu\mu c/ft^2$ at Los Angeles. (auth)

7070 WT-1212

Food and Drug Administration, Washington, D. C. and Federal Civil Defense Administration, Battle Creek, Mich.

EFFECTS OF NUCLEAR EXPLOSIONS ON CANNED FOODS. Carlos A. Greenleaf, James M. Reed, George O. Sampson, E. Rolland McConnell, and John M. Sharf. Mar. 1956. 89p. Project 32.2 [of] OPERATION TEAPOT. $0.50(OTS).

To test the effect of nuclear explosions upon heat-sterilized foods canned in both tin and glass containers, 60 different commercial products covering the categories of vegetables, fruits, juices, fish and shellfish, meats and poultry, specialties, soups, baby foods, and milk were exposed to a shot having about one and one-half times the 20-kt yield considered as nominal. Exposures covered a wide range of civilian handling conditions in homes, commercial storage, retail outlets, and emergency shelters to determine the suitability for use of canned foods either immediately or after some period of storage. Results of radiological, chemical, bacteriological, and organoleptic tests revealed that canned foods in unbroken tin or glass containers, subjected to an atomic blast, are suitable for immediate use when located in shelters or other structures effective in protecting personnel against lethal radiation or blast effects. Their induced radioactivity is not at a dangerous level, and any container failure is readily discernible. Canned foods that might be recoverable from critically exposed areas within the zone of complete destruction could be pressed into emergency service after three or four days. To minimize mechanical crushing and perforation damage, basement storage of canned foods is preferable to kitchen storage, and the storage area should be out of direct line with windows or doors. Under extreme conditions of exposure to blast overpressures there was some obvious container destruction, and radioactivity was induced in the foods and containers by the high radiation level. If unopened containers show considerable activity when monitored after an explosion, they should not be discarded. Container radioactivity has no bearing on the suitability of the food for use. The container should be brushed, wiped, or washed to remove fall-out material and opened so that the contents can be monitored. Very active containers, in many instances, will contain food that is entirely safe. Visual indications of extreme exposure are sharp crushing deformations of can bodies or coloration of glass jars. No significant losses in nutrient values occurred, and no harmful effects were observed in monkeys, rats, and dogs fed on the critically exposed foods. (auth)

7071

EXPERIMENTAL AND CLINICAL RESEARCH ON THE RADIO-PROTECTIVE ACTION OF CYSTEAMINE AND CYSTAMINE. III. CLINICAL RESEARCH. G. Baldini and L. Ferri (Univ. of Pavia, Italy). Brit. J. Radiol. 30, 271-3(1957) May.

7072

THE ADRENOCORTICOTROPIC HORMONE EFFECTS ON THE SURVIVAL AND SH CONTENT IN THE SOLUBLE ALBUMEN IN THE LIVER OF IRRADIATED RATS. E. M. Kedrova (Inst. of Biological and Medical Chemistry, Acad. of Med. Sciences U.S.S.R.). Med. Radiol. 2, No. 2, 42-6 (1957) Mar.–Apr. (In Russian)

7073

SOME MEANS OF ELIMINATING ERYTHROCYTE HEMOLYSIS INDUCED BY IONIZING RADIATION. A. P. Belousov (Molotov State Research Inst. of Roentgenology and Radiology.). Med. Radiol. 2, No. 2, 46-54(1957) Mar.–Apr. (In Russian)

7074

EFFECT OF BONE MARROW TREATMENT ON MORTALITY OF MICE IRRADIATED WITH FAST NEUTRONS. M. L. Randolph, C. C. Congdon, Irene S. Urso, and D. L. Parrish (Oak Ridge National Lab., Tenn.). Science 125, 1083-4(1957) May 31.

7075

GAMMA RAYS FROM LOCAL RADIOACTIVE SOURCES. H. V. Neher (California Inst. of Tech., Pasadena). Science 125, 1088-9(1957) May 31.

7076

CHEMICAL PROTECTION AGAINST X-RADIATION DEATH IN PRIMATES: A PRELIMINARY REPORT. B. G. Crouch and R. R. Overman (Univ. of Tennessee Coll. of Medicine, Memphis). Science 125, 1092(1957) May 31.

RADIATION SICKNESS

7077

PATHOPHYSIOLOGICAL REACTIONS IN ACUTE RADIATION SICKNESS. I. R. Petrov and V. K. Kulagin. Med. Radiol. 2, No. 2, 3-12(1957) Mar.–Apr. (In Russian)

RADIOGRAPHY

7078

ON PERSPECTIVES OF USING PREPARED RADIOACTIVE ISOTOPES IN MEDICAL GAMMA RADIOGRAPHY. I. A. Bochvar and U. Ya. Margulis. Med. Radiol. 2, No. 2, 70-7 (1957) Mar.–Apr. (In Russian)

RADIOTHERAPY

7079

THE CHOICE OF A RADIOACTIVE ISOTOPE FOR TREATMENT OF CARCINOMA OF THE THYROID. A. F. Phillips (Addenbrooke's Hospital, Cambridge). Brit. J. Radiol. 30, 247-53(1957) May.

7080

ON THE RELATION OF THE THERAPEUTIC EFFECT OF X RAY ON THE GENERAL RESISTANCE OF ANIMALS CARRYING MALIGNANT NEOPLASMS. S. N. Aleksandrov (Leningrad Central Research Roentgen-Radiological Inst.). Doklady Akad. Nauk S.S.S.R. 113, 90-3(1957) Mar. 1. (In Russian)

7081
SELECTED PAPERS FROM THE INSTITUTE OF CANCER RESEARCH: ROYAL CANCER HOSPITAL AND FROM THE ROYAL MARSDEN HOSPITAL, 1954. VOL. 9. London, Institute of Cancer Research, Royal Cancer Hospital and Royal Marsden Hospital, 1957. 918p.

Reprints are presented of 86 recent papers presenting results of clinical importance in the diagnosis and treatment of cancer. An author index is included. (C.H.)

TOXICOLOGY STUDIES

7082
ALUMINUM IN THE ENVIRONMENT OF MAN. Irene R. Campbell, Jules S. Cass, Jacob Cholak, and Robert A. Kehoe. Arch. Ind. Health 15, 359-448(1957) May.

TRACER APPLICATIONS

7083
RADIOISOTOPE MYELOGRAPHY. Franz K. Bauer and Eric T. Yuhl (Wadsworth Hospital, Veterans Administration Center, Los Angeles, Calif.). Intern. J. Appl. Radiation Isotopes 2, 52-8(1957) Apr.

Space-occupying lesions of the spinal canal can be detected with ease by means of scanning of the patient's back following the instillation of a gamma emitting tracer agent into the subarachnoid space. The method described uses radioiodinated human serum albumin as the tracer agent. This substance is considered to be a homologous protein which diffuses readily throughout the subarachnoid space and is removed intact into the blood-stream within several hours after the intrathecal injection. The advantages of the method are: the fact that the procedure can be done on an out-patient basis, since only one lumbar puncture is necessary, no elaborate x-ray facilities are necessary, and that the tracer agent does not have to be removed as is the case with radiopaque media such as pantopaque. Radioisotope myelography has been accurate in thirty of the thirty-four patients in whom it was technically satisfactory. In three patients it was technically unsatisfactory. It is not designed to supplant oil myelography, since small lesions cannot be detected by scanning, whereas they may be detected by fluoroscopy and different views on the roentgenograms. (auth)

7084
RADIOACTIVE CONTAMINATION OF FOODSTUFFS FROM FALL-OUT AS A SOURCE OF ERROR IN SOME ANIMAL EXPERIMENTS. C. G. Clayton (Royal Victoria Infirmary, Newcastle upon Tyne). Nature 179, 829-30(1957) Apr. 20.

7085
EFFECTS OF CORTISONE ACETATE UPON THE DISTRIBUTION AND EXCRETION OF RADIOYTTRIUM. Bergene Kawin (Michigan State Univ., East Lansing). Nature 179, 871-2(1957) Apr. 27.

7086
MEASUREMENTS OF VERY LOW CONCENTRATIONS OF α-RADIATION IN PLANTS BY MEANS OF THICK LAYER PHOTOPLATES. B. P. Soltitskii and A. L. Kartuzhanskii (Leningrad Inst. of Agriculture). Zhur. Tekh. Fiz. 27, 606-13(1957) Mar. (In Russian)

CHEMISTRY

7087 CCC-1024-TR-222
Callery Chemical Co., Penna.
RESIDENCE TIMES AND CONVERSIONS IN CONTINUOUS-FLOW, STIRRED-VESSEL REACTOR SYSTEMS. D. K. Eads — L. S. Stone and P. M. Maginnity, eds. Jan. 22, 1957. 22p.

By regarding a continuous reactor as a means of taking an infinite sequence of micro reactors to reaction conditions, keeping them there for a certain length of time and then returning them to non-reacting conditions, an equation was developed for the design of continuous-flow, multi-vessel, reactor systems. This equation involves the residence-time characteristics of such a system, and an expression for these characteristics was developed on the basis of the usual assumption of instantaneous mixing in every stage. One analytical and two graphical design procedures were developed from these equations. Also, a rather crude but useful procedure for approximate reactor design was developed to permit direct orienting of design and thus eliminate much of the tedious trial-and-error calculation that is normally required. (auth)

7088 NP-6290
University of Southern Calif., Los Angeles.
TRANSPORT PROCESSES IN LIQUID SYSTEMS. Final Report [for] June 27, 1952 to January 15, 1957. Arthur W. Adamson. 38p. Contract DA-04-495-Ord-364.

Data on binary diffusion and self diffusion in H_2O-D_2O and sucrose$-H_2O$ is tabulated. The entire concentration range in each system is covered and available viscosity, density, and activity coefficient data are filled out. Attempts to measure the nature of the coupling between components of a binary system using inert markers are described. Development of a more adequate theory of binary diffusion is in progress. (See also NP-4635.) (T.R.H.)

7089 NP-6307
Brussels. Centre D'Etudes Pour Les Applications de l'Energie Nucleaire.
PREPARATION DU FLUORURE DE ZIRCONIUM ANHYDRE PUR. (Preparation of Pure Anhydrous Zirconium Fluoride). C. Decroly, D. Tytgat, and J. Gerard. Aug. 1, 1956. 21p. (R-1259).

The preparation of pure, anhydrous ZrF_4 with HF on a large scale in the laboratory is described. The raw material used for separation is pure ZrO_2. The fluorinating agent used was $NH_4F.HF$. The $(NH_4)_2ZrF_6$ was changed to ZrF_4 by firing at 500°C in a vacuum. The ZrF_4 was purified by vacuum sublimation at 700°C. The equipment used for the vacuum sublimation is described. The yield of the conversion of oxide to sublimed fluoride was about 95%. (Tr—T.R.H.)

7090 ORNL-2268
Oak Ridge National Lab., Tenn.
PROGRESS REPORT ON RAW MATERIALS FOR JANUARY 1957. K. B. Brown, C. F. Coleman, D. J. Crouse, and A. D. Ryon. May 24, 1957. 17p. Contract W-7405-eng-26. $0.20(OTS).

Background information and descriptions of the various phases of the raw materials program at ORNL are given in this initial report of a series. Organonitrogen extraction processes, organophosphorus extraction processes, systematic studies, fundamental chemistry, and engineering studies are summarized. A bibliography of ORNL reports is included. (T.R.H.)

7091 UCRL-3710
California. Univ., Berkeley. Radiation Lab.
CHEMISTRY DIVISION QUARTERLY REPORT [FOR] DECEMBER 1956, JANUARY, FEBRUARY, 1957. Mar. 19, 1957. 96p. Contract W-7405-eng-48. $0.50(OTS).

Progress is reported in bio-organic chemistry and nuclear chemistry. The reliability of C^{14} distribution determination in algae killed and extracted with EtOH was studied. The effect of poisoning with EtOH and KCN on C^{14}

distribution in Chlorella was compared. Experiments on growth of Chlorella in heavy water were continued. The effect of Mn deficiency on CO_2 metabolism in Nostoc was studied. The inhibition of azaserine and diaza-oxo-norleucine on Scenedesmus and Chlorella was investigated. Data are given on the effects of gamma radiation on CO_2 fixation in Chlorella. Preparation methods are given for carboxydismutase and ribulose diphosphate. Glucose dissimilation in a free-cell neoplasm was studied. Studies of the effect of pancreatectomy on glucose metabolism in rats are described. Diisopropylfluorophosphonate distribution in rats and its effect on brain cholinesterase were investigated. Also reported are studies on: the inhibition of ascites tumors by D_2O, radiation effects on choline chloride, spectra of Cu complexes, and design of a large, high-intensity Co^{60} gamma source. In nuclear chemistry, investigations are reported on: S^{35} nuclear properties, preparation of Gd^{142} and Tb^{152} by double neutron capture, neutron-deficient Tb and Dy isotopes, half-thickness values for γ-rays in Pb, deuteron induced reactions of U^{234}, U^{235}, and U^{238}, and structures of yttrium oxyfluoride. (For preceding period see UCRL-3629.) (T.R.H.)

7092 WADC-TR-57-110

Battelle Memorial Inst., Columbus, Ohio.

POLYMERIZATION STUDIES ON MONOMERS AND EVALUATION OF DERIVATIVE POLYMERS. Period covered: March 1, 1956 to January 31, 1957. Faber B. Jones, Cherie A. Lichtenwalter, Palmer B. Stickney, and Randall G. Hellighann. Jan. 1957. 171p. Project title: RUBBER, PLASTIC, AND COMPOSITE MATERIALS. Task title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-3313.

Research in the polymerization characteristics of some fluorinated olefin oxide monomers is described. Some evaluation of the potential of the resulting polymers as high-temperature and solvent resistant rubbers and plastics were made. (See also NP-6167.) (T.R.H.)

7093

POLONIUM. THE NEGLECTED ELEMENT. Atomics 8, 173-4(1957) May.

Methods of separation, properties, and compounds of polonium are summarized. (M.H.R.)

7094

NEW STATISTICAL METHOD RAPIDLY DETERMINES OPTIMUM PROCESS CONDITION. S. I. Neuwirth and L. M. Naphtall (Polytechnic Inst. of Brooklyn, N. Y.). Chem. Eng. 64, No. 6, 238-42(1957) June.

A statistical method is presented for determining optimum process conditions by taking the steepest slope path to the summit. (W.L.H.)

7095

EFFECT OF PRESSURE ON THE ISOTOPE EFFECT IN A UNIMOLECULAR GASEOUS REACTION: TRITIUM AND CARBON-13 EFFECTS IN THE ISOMERIZATION OF CYCLOPROPANE. Ralph E. Weston, Jr. (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 26, 975-83(1957) May.

As a new means of studying the effect of pressure on unimolecular gaseous reaction kinetics, the tritium isotope effect in the isomerization of cyclopropane to propylene has been measured. At a pressure of 200 mm, the ratio of rate constants for unlabeled and singly-labeled species is given by $k/k' = (0.86 \pm 0.06) \exp(385 \pm 95/RT)$. The temperature range was 406 to 492°C. As the pressure decreases, the isotope effect is lowered and, within experimental error, disappears at 1 mm. Upon the addition of inert gas to cyclopropane at this pressure, the isotope effect is increased to a value corresponding to a higher pressure of reactant. The carbon-13 isotope effect was measured at 1 atmos and 492°, and was found to be $k/k' = 1.0072 \pm 0.0006$. This may be explained on the basis of a change in either a carbon-carbon or a carbon-hydrogen bond in the transition state. (auth)

7096

CARBON ISOTOPE EFFECT DURING OXIDATION OF CARBON MONOXIDE WITH NITROGEN DIOXIDE. Harold S. Johnston, William A. Bonner, and David J. Wilson (Stanford Univ., Calif.). J. Chem. Phys. 26, 1002-6(1957) May.

By use of naturally occurring C^{12} and C^{13} isotopes in CO, the effect of carbon mass on the rate of the reaction $CO + NO_2 = CO_2 + NO$ has been studied in a 15-l Vycor flask, in the temperature range 540 to 727°K, and at pressures between 1 and 20 mm. The rate constant for the reaction was $k = 12 \times 10^{12} \exp(-31{,}600/RT)$ cc/mole/sec. The ratio of rate constants k_{12}/k_{13} was 1.022 at 540°K, 1.019 at 638°K, and 1.016 at 727°K. (auth)

7097

INTEGRATED RATE EQUATIONS FOR ISOTOPIC EXCHANGE IN SIMPLE REVERSIBLE REACTIONS. Robert A. Alberty and Wilmer G. Miller (Univ. of Wisconsin, Madison). J. Chem. Phys. 26, 1231-7(1957) May.

The integrated rate equations are given for various mechanism by which three substances may be interconverted by first-order reactions. These equations are of special interest in the interpretation of isotopic exchange in the presence of an over-all chemical reaction. When certain rate constants in the mechanism are equal or have the same ratio as the ratio of concentrations of isotopic species in the reaction medium, considerable simplification of the integrated rate equation occurs. (auth)

7098

PHASE TRANSITION TEMPERATURE OF POLONIUM. J. M. Goode (Mound Lab., Miamisburg, Ohio). J. Chem. Phys. 26, 1269-71(1957) May.

The phase transition temperatures of Po have been measured using x-ray diffraction. Transition of α to β polonium occurs at 54°C ± 1.5°C and the β to α transition occurs at 18°C ± 1.5°C. The special sample mount used is described. (auth)

7099

FLUORESCENCE EFFICIENCIES OF ORGANIC COMPOUNDS. Milton Furst, Hartmut Kallmann, and Felix H. Brown (New York Univ.). J. Chem. Phys. 26, 1321-32 (1957) May.

The relative fluorescence efficiencies of a large number of organic compounds of different structures were measured in solution under high-energy and ultraviolet excitations. P/R values of the more efficient solutes under high-energy excitation are given. Where possible at room temperature the fluorescence under high energy was also determined for the compound in solid form. A considerable parallelism is found between the relative fluorescence efficiencies in solution under both modes of excitation. Oxygen effects were measured and found to be greater on the solvent than on the solute, but do not greatly influence the relative efficiencies. Changes in fluorescence produced by substituents which do not considerably alter the absorption spectrum are discussed. (auth)

7100

SURFACE DIFFUSION OF HYDROGEN ON NICKEL. R. Wortman, R. Gomer, and R. Lundy (Univ. of Chicago, Ill.). J. Chem. Phys. 26, 1334-5(1957) May.

7101

THE BARIUM FLUORIDE–URANIUM TRIFLUORIDE SYSTEM. R. W. M. D'Eye and F. S. Martin (Atomic Energy Research Establishment, Harwell, nr. Didcot, Berks). J. Chem. Soc. 1847-51(1957) Apr.

The system UF_3–BaF_2 has been examined by x-ray and

density measurements and by thermal analysis. Uranium trifluoride dissolves in solid BaF_2 to the extent of about 50 mole %, the cell constant a decreasing from 6.189 to 6.034 kX; barium fluoride dissolves in UF_3 to the extent of about 20 mole %. These two conjugate solid solutions exist between definite concentration limits. It is also shown that UF_3 may form a solid solution in SrF_2. The melting point of UF_3 is found to be about 1495°; its addition to BaF_2 increases the melting point of the latter, and it is suggested that the system has a peritectic point at about 1400°. (auth)

7102

THE COMPRESSIBILITIES OF THE SILICATES: THE Li_2O–SiO_2 SYSTEM. Harry Bloom and John O'M. Bockris (Univ. of Pennsylvania, Philadelphia). J. Phys. Chem. 61, 515-18(1957) May.

Two models for the liquid silicates indicate different courses for the compressibility isotherms as a function of composition. An apparatus is described which permits measurement of the compressibilities of liquids up to T = 1350°C. Compressibilities have been measured for the Li_2O–SiO_2 system over the composition range 24–55% Li_2O. Results are in disagreement with the classical model and give some support to the discrete anion model. (auth)

7103

HOMOGENEOUS DECOMPOSITION OF HYDROGEN PEROXIDE VAPOR. Charles N. Satterfield and Theodore W. Stein (Massachusetts Inst. of Tech., Cambridge). J. Phys. Chem. 61, 537-40(1957) May.

Studies of the thermal decomposition of H_2O_2 vapor under flow conditions in a relatively inert glass reactor show a transition from heterogeneous to homogeneous reaction in the temperature range of 400 to 450°C, at a partial pressure of 0.02 atmosphere. The homogeneous reaction was of 3/2 order and had an activation energy of 55,000 cal. The decomposition mechanism appears to involve very long straight chains. (auth)

7104

CALCULATION OF EXPERIMENTAL ISOTOPE EFFECTS FOR PSEUDO FIRST-ORDER IRREVERSIBLE REACTIONS. James Ying-peh Tong and Peter E. Yankwich (Univ. of Illinois, Urbana). J. Phys. Chem. 61, 540-3(1957) May.

Four exact equations are derived for the calculation of experimental isotope effects of systems of pseudo first-order irreversible reactions. The input data are either measured isotope ratios alone, or a combination of isotope ratios with the measured reaction coördinate. The advantages and disadvantages of these equations over those of the zero-time approximation method are discussed. (auth)

7105

STUDY OF THE ISOTOPIC EXCHANGE BETWEEN Te(IV) AND Te(VI) IN ACID SOLUTION. M. W. Hanson and T. C. Hoering (Univ. of Arkansas, Fayetteville). J. Phys. Chem. 61, 699(1957) May.

7106

DEVELOPMENT OF CHEMICAL STUDIES AT SUPER-HIGH COMPRESSIONS. M. G. Gonikberg. Vestnik Akad. Nauk S.S.S.R. 28, 50-8(1957) Feb. (In Russian)

A report is made on the chemical investigation techniques and technological achievements in compression of solid and fluid materials under super-high pressures. (R.V.J.)

ANALYTICAL PROCEDURES

7107 AERE-C/R-2081

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE SPECTROGRAPHIC ESTIMATION OF MAJOR-CONSTITUENT PLUTONIUM BY THE IRON-FLUX METHOD. F. T. Birks. Dec. 1956. 8p.

Plutonium has been estimated in solids using a d-c arc on Cu electrodes after making a 10:1 dilution of the sample with a flux consisting of $Fe_2(SO_4)_3$ and $(NH_4)_2SO_4$. The concentration range covered was 0.5 to 100% PuO_2 and at the 50% level the coefficient of variation was 6.6%. The index point of equal intensity for the intensity ratio of Pu 2904.3 and Fe 2901.4 was found at 42.2% PuO_2. Equalities with other Fe lines having different intensities may be used in order to obtain a rapid visual estimation of the PuO_2. The estimation of the major common impurity elements may be carried out simultaneously with the Pu. (auth)

7108 AWRE-O-4/57

Gt. Brit. Atomic Weapons Research Establishment, Aldermaston, Berks, England.

THE DETERMINATION OF NITROGEN IN HYDROGEN AND DEUTERIUM GAS. M. E. D. Bains. Mar. 1957. 9p.

A method has been developed for the determination of N_2 and H_2 and/or D_2 gases from 100 ppm by volume upwards. The gases are introduced into a purified stream of A and passed over heated Ti sponge, where the N_2 is absorbed. The N_2 is determined as NH_3 by a macro-Kjeldahl method. (auth)

7109 GS-B-1029-A

Geological Survey.

ANNOTATED BIBLIOGRAPHY OF THE ANALYTICAL CHEMISTRY OF NIOBIUM AND TANTALUM, JANUARY 1935–JUNE 1953. Frank Cuttitta. 1957. 75p. $0.25 (GPO).

This annotated bibliography includes reports of work published in the period January 1935 to June 1953 and has been compiled mainly from Chemical Abstracts and from Nuclear Science Abstracts. It refers the reader to the original publications and to abstracts and discussions (summaries) of them. Author and subject indexes are supplied, and also lists of abbreviations used for the serials to which reference is made, and of AEC code designations and depository libraries where reports so designated can be examined or obtained. (auth)

7110 HW-43096

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

ANALYSIS OF HIGH PURITY WATER BY SPECTROCHEMISTRY. J. L. Daniel and R[oy] Ko. May 7, 1956. 18p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40 (mf OTS).

7111 IGO-AM/W-80

Gt. Brit. Windscale Works, Sellafield, Cumb., England.

THE DETERMINATION OF MOISTURE IN GASEOUS CARBON DIOXIDE UNDER PRESSURE (KARL FISCHER METHOD). Mar. 23, 1957. 5p.

Moisture in CO_2 is determined by measurement of the volume of gas required to react with a known quantity of Karl Fischer reagent. (auth)

7112 ORO-165

Arkansas. Univ., Fayetteville.

SOME LIMITATIONS ON THE USE OF NEUTRON ACTIVATION ANALYSIS. R. W. Fink. [1957]. 4p. Contract [AT(40-1)-277]. $1.80(ph OTS); 1.80(mf OTS).

It is shown that neutron activation analysis in the region of a few ppm or less must be applied with great care to the determination of Z-1 and Z-2 elements. (T.R.H.)

7113

INVESTIGATION OF CHEMICAL SEPARATION METHODS FOR Ca AND Sr. QUANTITATIVE DETERMINATION OF

BOTH ELEMENTS IN Ca–Sr MIXTURES BY THE ISOTOPIC DILUTION METHOD. G. Leliaert and J. Eeckhaut (Univ. of Ghent, Belgium). Anal. Chim. Acta 16, 311-20 (1957) Apr.

The quantitative separation of Ca and Sr by some of the most interesting chemical procedures has been investigated, using radiochemical tracer techniques. It could be shown that no satisfactory separation could be achieved and good results are obtained in some cases by compensation of errors. The results have been used for the development of an isotopic dilution method for the determination of Ca and Sr in mixtures of their salts. Reliable results are obtained on the semi-micro-scale. (auth)

7114

COLORIMETRIC AND GRAVIMETRIC DETERMINATION OF SILICON IN TITANIUM AND TITANIUM ALLOYS. Maurice Codell and George Norwitz (Frankford Arsenal, Philadelphia, Penna.). Anal Chim Acta 16, 327-32(1957) Apr.

Improved colorimetric and gravimetric methods are proposed for the determination of Si in Ti and Ti alloys. In the colorimetric method the sample is dissolved in HF, H_3BO_3 added and the Ti oxidized with H_2O_2 and $KMnO_4$. The bulk of the Ti is precipitated as a crystalline precipitate by heating in boiling water, and the Mo color developed. A portion of the solution is filtered and the transmittance measured. In the gravimetric method the sample is fumed with H_2SO_4, the silica ignited and fused with Na_2CO_3. The silica is then dehydrated with $HClO_4$. The colorimetric method is recommended for 0.003 to 1.5% Si, and the gravimetric method for 0.3 to 5% Si. (auth)

7115

FLUORIMETRIC DETERMINATION OF ZIRCONIUM WITH MORIN. Richard A. Geiger and E. B. Sandell (Univ. of Minnesota, Minneapolis). Anal. Chim. Acta 16, 346-54 (1957) Apr.

Zirconium can be determined fluorimetrically with morin in 2M HCl in the presence of such elements as Al, Be, Ga, Sb, Sn, Th and U, which fluoresce much less strongly under the conditions, by measuring the fluorescence intensity before and after adding EDTA. This substance destroys the fluorescence of Zr only and the difference in fluorescence intensities corresponds to the concentration of Zr in solution. The determination of Zr in the presence of Al has especially been studied. Satisfactory accuracy can be obtained even when Al/Zr = 10,000, if the proper morin concentration is used. Iron does not interfere if reduced to Fe^{2+} with mercaptoacetic acid. Zirconium can be determined in silicate rocks without any separations except those made automatically in the Na_2CO_3 decomposition. Niobium and tantalum should not exceed 0.05%. (auth)

7116

THE USE OF TRITIUM BREMSSTRAHLUNG FOR THE DETERMINATION OF SULPHUR IN HYDROCARBONS. M. M. Kannuna and J. E. Cameron (A.E.R.E., Harwell). Intern. J. Appl. Radiation Isotopes 2, 76-9(1957) Apr.

Bremsstrahlung with a maximum energy of 18 kev is emitted when tritium β particles strike a target. This continuous spectrum of radiation is used as a means of estimating sulfur in hydrocarbons. The sensitivity and accuracy compare favorably with other methods of determination, in particular with that using iron-55 x-rays. A relatively cheap means of determining heavy contaminants in hydrocarbons is thus provided. (auth)

7117

THE NATURE AND STABILITY OF THE COMPLEX IONS FORMED BY TER-, QUADRI-, AND SEXA-VALENT PLUTONIUM IONS WITH ETHYLENEDIAMINETETRAACETIC ACID. PART I. pH TITRATIONS AND ION-EXCHANGE STUDIES. J. K. Foreman and T. D. Smith (Windscale Works, Sellafield, Cumberland). J. Chem. Soc. 1752-8 (1957) Apr.

Potentiometric pH titrations and cation-exchange studies have shown that Pu^{3+}, Pu^{4+}, and plutonyl ions form 1:1 chelates with ethylenediaminetetra-acetic acid (EDTA). In the first two cases complexes containing two atoms of Pu to one molecule of EDTA are also formed. The stability constants for the 1:1 complexes of the three ions have been determined by a cation-exchange technique; the values of log K are: Pu^{3+}, 18·12; Pu^{4+}, 17·66; plutonyl, 16·39. The value for the plutonium(IV) chelate relates to a hydrolysed species of the ion. (auth)

7118

THE NATURE AND STABILITY OF THE COMPLEX IONS FORMED BY TER-, QUADRI-, AND SEXA-VALENT PLUTONIUM IONS WITH ETHYLENEDIAMINETETRAACETIC ACID:(EDTA). PART II. SPECTROPHOTOMETRIC STUDIES. J. K. Foreman and T. D. Smith (Windscale Works, Sellafield, Cumberland). J. Chem. Soc. 1758-62(1957) Apr.

Absorption spectra of the ethylenediaminetetra-acetates of Pu^{3+}, Pu^{4+}, and Pu^{6+} are presented, and the stability constants of these chelates obtained from them. Chelation of the unhydrolysed Pu^{4+} ion with ethylenediaminetetra-acetate in 1n-nitric acid has been observed. (auth)

7119

SPECTRAL ANALYSIS BY THE VAPORIZATION METHOD. Yu. I. Belyaev and A. N. Zaidel (Vernadski Moscow Inst. of Geochemistry and Analytical Chemistry). Zhur. Analit. Khim. 12, 30-40(1957) Jan.-Feb. (In Russian)

The degree of condensation of small amounts of Cd, Zn, Tl, Sb, Bi, Ni, Ba, Na, and K have been determined by evaporation in PuO_2, ThO_2, U_3O_8, ZrO_2, and La_2O_3 in air and in vacuum (10^{-2} mm Hg). The relative error is ±6%. It has been shown that at 1600 to 2000°C the degree of condensation does not depend on the basic components of the specimens. The temperature values beyond which the volatile impurities are released in the crystal lattice of PuO_2, ThO_2, U_3O_8, La_2O_3, and ZrO_2 have been determined. The relation of the degree of condensation to the temperature, duration of evaporation, and the geometrical factors has been studied. (tr-auth)

FLUORINE AND FLUORINE COMPOUNDS

7120 AD-120678

THE THERMAL REACTION OF FLUORINE AND CHLORINE HEXOXIDE (Cl_2O_6). (Die Thermische Reaktion zwischen Fluor und Chlorhexoxyd (Cl_2O_6).) A. J. Arvia, W. H. Basualdo, and H. J. Schumacher. Translated from Angew. Chem. 67, 616(1955). 4p.

In experiments to produce $FClO_2$ from F_2 and Cl_2O_6 the products obtained were $FClO_2$, Cl_2O_7, and very small amounts of a compound supposedly ClO_3F, an isomer of $FClO_3$. (T.R.H.)

7121 AD-120679

THE THERMAL STABILITY OF CHLORYL FLUORIDE ($FClO_2$). (Die Thermische Stabilität des Chloryifluorids ($FClO_2$).) H. J. Schumacher and W. H. Basualdo. Translated from Angew. Chem. 67, 231(1955).

7122

USE OF TETRAFLUOBORIC ACID IN QUANTITATIVE ANALYSIS. I. WEIGHT DETERMINATION OF ALKALI METALS IN BORATES, HALIDES, NITRATES, AND NITRITES. I. G. Ryss and E. L. Nilus (Dnepropetrovsk Metallurgical Inst.). Zhur. Analit. Khim. 12, 64-9(1957) Jan.-Feb. (In Russian)

The possibility of quantitative conversion of fluorides, chlorates, bromides, iodides, nitrates, nitrites, borates,

and mixtures of borates and fluorides of alkali metals (with the exclusion of Li) into tetrafluorborates has been shown. Also, it was found that mixtures of HF and H_3BO_3 completely evaporate when the molar ratio HF/H_3BO_3 exceeds 2.5, and $LiBF_4$ decomposes very slowly at 110 to 150° while $NaBF_4$ remains quite stable at 200° and decomposes slowly at 220°. (tr-auth)

GRAPHITE

7123 IGR-TN/C-540

Gt. Brit. Culcheth Labs., Culcheth, Lancs, England.
MECHANICAL TESTS ON GRAPHITE BLOCK 1. E. A. Clough and G. Rose. Apr. 1957. 13p. (IGC-HRGP/P-46).

An analysis of the variation of compressive strength and bulk density within a block of grade A pile graphite is given, with an explanation of the statistical process used. Grand mean compressive strength and bulk density were found to be 1.349 tons/in.^{2} and 1.7765 g/cc respectively. In the case of compressive strength, it stated with 90% confidence that the difference between tests in the longitudinal and transverse directions is less than ± 0.087 tons/in.^{2} Specimens taken from positions close together in the block are dhown to be significantly more similar than specimens sited far apart. Differences between the latter cannot be attributed to layering effects in the block. In the case of the bulk density measurements, it was found that "outer" material was significantly more dense than "inner" material. (auth)

7124

MAGNETIC SUSCEPTIBILITY OF NEUTRON-DAMAGED GRAPHITE. John E. Hove and J. D. McClelland (Atomics International, Canoga Park, Calif.). J. Chem. Phys. 26, 1028-30(1957) May.

Previous work on the magnetic susceptibility of graphite as it is affected by temperature and bromination is extended to include effects of neutron irradiation at about room temperature. Data taken at both room temperature and liquid nitrogen temperature are analyzed and yield consistent values for the number of electrons trapped out by damage defects, thus further establishing the validity of the theory. The trapping rate of electrons, with neutron exposure, is found to be slightly nonlinear and a fair fit of the empirical curve is: number of trapped electrons per carbon atom = $1.4 \times 10^{-4} t^{\frac{2}{3}}$, where t is the flux in mwd/ct. This two-thirds power dependence cannot be taken too literally, since neither the quantity nor quality of the data is sufficiently good. Data are also given for the buildup of paramagnetic centers as damage increases. (auth)

7125

KINETICS OF GRAPHITE OXIDATION. George Blyholder and Henry Eyring (Univ. of Utah, Salt Lake City). J. Phys. Chem. 61, 682-8(1957) May.

A description of an apparatus for studying heterogeneous gas–solid reactions in the one to one hundred μ pressure and 600 to 1300°C temperature range is presented. The data for the graphite–oxygen reaction from 600 to 800°C are presented. The surface reaction is zero order with an 80 kcal per mole activation energy. On samples thicker than 0.1 mm., the diffusion of oxygen into the pores in the graphite results in an observed one-half order reaction with a 42 kcal per mole activation energy. Carbon monoxide is shown to be the primary reaction product. (auth)

LABORATORIES AND EQUIPMENT

7126 IDO-14406

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
APPARATUS FOR REMOTE VOLUMETRIC TITRIMETRY. Fred W. Dykes, Richard G. Masterson, and James E. Rein. Apr. 1, 1957. 21p. Contract AT(10-1)-205. $0.25(OTS).

Special apparatus fabricated and used successfully for remote volumetric titrimetry at ICPP is described. Typical applications and reliability data are given. (T.R.H.)

7127

REMOTE HANDLING EQUIPMENT. A. B. Ritchie and R. A. G. Welsher (A.E.R.E., Harwell). Nuclear Eng. 2, 201-3(1957) May.

The fundamental considerations of remote handling equipment are reviewed. Discussions are included on protection against the various types of radiation, the possible necessity of an inert atmosphere, the provision of viewing systems, and protection against equipment deterioration. (M.H.R.)

Refer also to abstract 7067.

RADIATION CHEMISTRY

7128

THE IRRADIATION OF UNSATURATED POLYESTER RESINS. A. Charlesby and V. Wycherley (Tube Investments Research Labs., nr. Cambridge). Intern. J. Appl. Radiation Isotopes 2, 26-34(1957) Apr.

7129

EFFECT OF GAMMA-RAYS ON DITHIZONE IN SOME ORGANIC SOLVENTS. J. Wilkinson and H. J. M. Fitches (Univ. of Durham). Nature 179, 863-4(1957) Apr. 27.

RADIATION EFFECTS

7130 ORNL-2287

Oak Ridge National Lab., Tenn.
RADIATION DAMAGE TO TBP AND DILUENTS; COVERING PERIOD OCTOBER–DECEMBER 1956. J. H. Goode. May 24, 1957. 17p. Contract W-7405-Eng-26. $0.20(OTS).

Polymerization or other interaction between the radiation damage products of a hydrocarbon diluent and TBP solvent, which is intensified by the presence of an aqueous phase and/or heat, results in the formation of emulsifiers, uranium complexing agents, and other deleterious materials in irradiated solvent. Vacuum distillation satisfactorily separates undamaged solvent from the higher boiling degradation products. (auth)

7131 UCRL-3690

California. Univ., Berkeley. Radiation Lab.
FORMATION OF REVERSIBLE COLORED MODIFICATIONS AT LOW TEMPERATURES BY BOMBARDMENT WITH ELECTRONS. Yehuda Hirshberg. Feb. 15, 1957. 16p. Contract W-7405-eng-48. $0.20(OTS).

The effects of electron irradiation at low temperatures on some bianthrone and spiropyran compounds were examined. The colors induced were found to be very similar in properties to those obtained by ultraviolet irradiation of the same compounds. (auth)

7132

THE PREPARATION OF STABLE FREE RADICALS IN SOLUTION BY MEANS OF IONISING RADIATION. A. J. Swallow (Tube Investments Research Labs., Cambridge). J. Chem. Soc. 1553-5(1957) Apr.

Irradiation of a mixture of an easily reduced and an easily oxidised substance gives rise to a coupled oxidation–reduction. Methylene-blue has been irradiated in the presence of ethanol, and in strongly acid solution is reduced to the same stable semiquinone free radical as is produced by $TiCl_3$. Thionine also gives some free radical under these

conditions, but attempts to prepare triphenylmethyl and diphenylpicrylhydrazyl by irradiation have not succeeded. Reasons are given. (auth)

7133
THE ACTION OF X-RAYS (200 kV) AND γ-RAYS (^{60}Co) ON DILUTE AQUEOUS SOLUTIONS OF CERIC SALTS. G. R. A. Johnson and J. Weiss (Univ. of Durham, Newcastle upon Tyne 1). Proc. Roy. Soc. (London) A240, 189-205 (1957) May 21.

RARE EARTHS AND RARE-EARTH COMPOUNDS

7134 ORNL-2252
Oak Ridge National Lab., Tenn.
PREPARATION OF FISSION RARE-EARTH ISOTOPES. R. S. Pressly. May 24, 1957. 14p. Contract W-7405-eng-26. $0.20(OTS).

The methods now used for the separation of the short-lived rare earths are described. The separation techniques have been improved to the point that a single ion exchange column can be used to separate the short-lived rare earths from each other and from the actinide elements which are present in the solution. This report also describes the process of separating the long-lived rare-earth group and the development work which has led to this process. Ion exchange has been used effectively in separating the individual long-lived rare earths from each other and from the actinide elements in small quantities. The Pm^{147} is now separated from Am^{241} by precipitating PmF_3 from 3.0M hydrofluosilicic acid, leaving americium complexed in solution. Americium and promethium are recovered, and larger quantities are handled. (auth)

SEPARATION PROCEDURES

7135 AECU-3430
Michigan. Univ., Ann Arbor. Engineering Research Inst.
STUDY OF THE FEASIBILITY OF AQUEOUS RECOVERY OF SPENT FUELS. PART 5. INSTRUMENTATION DESIGN DATA. M. H. Winsnes. July 1954. 47p. (ERI-2240-5-F). $0.35(OTS).

Work done for Dow Chemical-Detroit Edison and Associates, Atomic-Power Development Project at request of Consumers Power Co. (Jackson County).

Parts 1 and 2 issued as AECU-3160 and AECU-3161, respectively.

A preliminary study of the instrumentation for the Detroit Edison Aqueous Recovery plant is presented. The instrumentation problems arising in the areas with radioactive radiation are discussed with respect to the application of pneumatic or electric instruments. Some aspects of automation versus manual control are considered. The control panel layout is discussed, and a semi-graphic panel layout is presented. A floor plan of the plant, and the chemical flowsheets are included. (auth)

7136 AECU-3462
Tennessee. Univ., Knoxville.
A STUDY OF THE REACTION RATE FOR THE ION EXCHANGE SYSTEM DOWEX-50, CALCIUM, AND SODIUM UNDER FLOW CONDITIONS. N. T. Anderson and F. N. Peebles. Dec. 1956. 82p. For [Oak Ridge National Lab.]. Contract W-7405-eng-26, Subcontract No. 783. $0.45(OTS).

The ion exchange system Dowex-50, Ca, Na, was studied by measuring concentration changes in feed solution passed over a ⅛-in. thick, 4-in. diam. bed of Dowex-50. The mechanism is diffusion controlled and obeys the theory to a reasonable degree. (T.R.H.)

7137 AECU-3463
Tennessee. Univ., Knoxville.
AN EXPERIMENTAL STUDY OF THE PERFORMANCE CHARACTERISTICS OF A CONTINUOUS COUNTERCURRENT ION EXCHANGE COLUMN. G. M. Drake, Jr., and F. N. Peebles. Mar. 1957. 91p. For [Oak Ridge National Lab.] Contract W-7405-eng-26, Subcontract No. 783. $0.50(OTS).

The 4-in. glass pipe column used in these studies was 13 ft high over-all. The Dowex-50W resin particle diameter range was 840 to 1100 μ when wet. The feed solution varied from 4,000 to 15,000 ppm $CaCO_3$; the regenerant solution was 1 wt. % NaCl. Data are reported for liquid flow rates from 40 to 75 gph/ft^2 based on empty column cross section. Successful operation at 100 gph/ft^2 was obtained; this is near the flow rate for fluidization of the resin particles. It is concluded that operation of a continuous, countercurrent, moving dense bed, ion exchange column up to flow rates corresponding to fluidization is satisfactory. (T.R.H.)

7138 AERE-ES/R-2089
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
THE REMOVAL OF FISSION PRODUCTS FROM SOLUTION WITH A PRECIPITATOR-COLUMN TREATMENT. PART 2. PILOT PLANT TRIALS. K. G. Seedhouse, J. Monahan, K. W. Pearce, and G. Wallis. Jan. 1957. 22p. (FPSD/P-20).

Part 1 issued as FPSD/P-13.

It has been found possible, on a pilot plant scale, to obtain a decontamination factor of 600 to 1,000 on a synthetic effluent. The process consists of treatment in a Sludge Blanket Precipitator with 80 ppm PO_4, 40 ppm Fe^{3+} at a pH of 11.5 followed by another precipitation at the same pH, using 20 ppm Fe^{2+} and 20 ppm S^{2-}. The effluent is finally passed through a column of Crude Vermiculite. The phosphate treatment removed 94% of the activity. This was increased to 98 to 99% by the sulfide precipitation. The chief effect of the sulfide treatment is to remove most of the radiocolloids, especially of cerium. The over-all decontaminations would not be greatly reduced if the sulfide precipitation was omitted, but it acts as a safeguard in case of difficulties in the column treatment. (auth)

7139 CF-56-12-128
Oak Ridge National Lab., Tenn.
CHEMICAL TECHNOLOGY DIVISION, UNIT OPERATIONS SECTION MONTHLY PROGRESS REPORT [FOR] DECEMBER 1956. J. C. Bresee, J. T. Long, E. O. Nurmi, and C. D. Watson. May 22, 1957. 81p. Contract [W-7405-eng-26]. $13.80(ph OTS); $4.80(mf OTS).

A fluidized bed dehydration run on Excer-produced $UF_4 \cdot \frac{1}{4} H_2O$ is reported. In Fluorox development, the reaction velocity constant for the reaction $UF_4 + O_2 \rightarrow UF_6 + UO_2F_2$ was expressed by $\ln K = 13.3 - 14.9\ (1000/T)$. Equipment installation and testing for homogeneous reactor fuel and blanket processing development is continued. Zircex Process experience with hydrochlorination of U–Zr alloys is described. Other power reactor fuel reprocessing studies reported include decladding, cutting, sawing, dissolver design, pulse column interfacial solids removal, and corrosion of Ti. Volatility process development continued with studies of F_2 disposal and gas-liquid contacting studies. (T.R.H.)

7140 CF-57-3-153
Oak Ridge National Lab., Tenn.
BIBLIOGRAPHY—NUCLEAR REACTOR FUEL PROCESSING. H. E. Goeller. Mar. 12, 1957. 14p. Contract [W-7405-eng-26]. $0.15(OTS).

7141 CRDC-630

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

TRIBUTYL PHOSPHATE PROCESSING OF PLUTONIUM–ALUMINUM ALLOY FUELS. R. G. Hart. Mar. 1957. 27p. (AECL-429). $1.00(AECL).

Partition coefficients pertinent to the processing of Pu-Al alloy fuels by TBP extraction have been obtained. McCabe-Thiele calculations have been made to predict behavior under various conditions in a continuous system. The calculations show that a system of extraction using 5% TBP–soltrol should give good Pu recovery and satisfactory fission product decontamination. A system of extraction using 20% TBP–soltrol would give good Pu recovery but poor fission product decontamination. If sufficient U to saturate the solvent is added to the Pu–Al dissolver solution, the fuel could be processed using 20% TBP–soltrol in the same manner and in the same plant as irradiated U. Good Pu recovery and good fission product decontamination should be obtained with this system. (auth)

7142 DOW-157

Dow Chemical Co. Western Div., Pittsburgh, Calif.

PROGRESS REPORT [FOR] APRIL 1957. Research Dept. R. H. Bailes. May 1, 1957. 19p. Contract AT-30-1-GEN-236. $3.30(ph OTS); $2.40(mf OTS).

A study of the preparation of high-grade U products by solvent extraction is presented. Tests of several alternative alkyl phosphate extractants for U from H_3PO_4 are reported. (auth)

7143 DP-181

Du Pont De Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

EXTRACTION OF THORIUM NITRATE FROM NITRIC ACID BY TBP—"ULTRASENE." Thomas H. Siddall. III. Oct. 1956. 22p. Contract AT(07-2)-1. $0.25(OTS).

Equilibrium data are presented for the distribution of $Th(NO_3)_4$ and HNO_3 between aqueous solutions and TBP diluted with kerosene. (auth)

7144 NAA-SR-1872

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

SEPARATIONS CHEMISTRY QUARTERLY PROGRESS REPORT [FOR] SEPTEMBER–DECEMBER 1956. E. E. Motta, G. E. Brand, A. G. Buyers, and W. J. Gardner. May 1, 1957. 23p. Contract AT-11-1-GEN-8. $0.25 (OTS).

The hot cave was completed and used for remotely operated kilogram-scale oxide drossing experiments on U fuel. In addition, an experiment using 33 kg of U alloy was conducted to determine the scavenging effect of UC_2 on Zr, Nb, and Mo and to study tilt-pour casting. The decontamination experiments involving fission product evaporation by arc melting have been directed toward the removal of fission products from irradiated Th-U alloys and the determination of the Pa loss from irradiated Th. The radiochemical analyses for the salt bed extraction experiments on irradiated Th–U alloy are nearing completion. The molten arc electrolysis efforts on Th consisted of experiments to determine the properties of container materials, electrolyte composition, and cathode alloy. (For preceding period see NAA-SR-1759.) (T.R.H.)

7145 RMO-4010

Columbia Univ., New York. Mineral Beneficiation Lab.

RECOVERY OF URANIUM FROM CHATTANOOGA SHALE. Quarterly Progress Report. Dec. 1956. 54p. Contract AT(49-1)-621. $7.80(ph OTS); $3.30(mf OTS).

Leaching research on raw Gassaway shale has continued along lines aimed ultimately at the development of a continuous process. Countercurrent leaching studies were extended to a lower flow ratio with some loss in leaching efficiency. Oxygen pressure leaching has continued. Work done in available batch leaching equipment was concentrated on obtaining recycled-leach data in an attempt to simulate continuous conditions. Preliminary rate data from such studies indicate the possibility of using relatively low residence times in continuous work. Investigations aimed at elucidating the reasons for low yields in continuous cocurrent (or batch) leaching at high pulp densities have continued. Uranium distribution curves for NBA (6-benzylamino-3,9-diethyltridecane) and an oxygen, pressure leach liquor are given. Considerable effort has been spent on improving the quality of NBA produced in this Laboratory. Some work on the design of continuous laboratory equipment is reported. (auth)

7146 WIN-69

National Lead Co. Raw Materials Development Lab., Winchester, Mass.

PRELIMINARY PILOT PLANT INVESTIGATION OF THE ACID LEACH–CCD–SOLVENT EXTRACTION PROCESS AS APPLIED TO WHITE CANYON ORES. A. W. Griffith, H. E. Gardner, and R. L. Shimmin. Apr. 12, 1957. 43p. $7.80(ph OTS); $3.30(mf OTS).

The preliminary operation of the Acid Leach–CCD–Solvent Extraction Pilot Plant at Grand Junction, Colorado, was conducted from November 8, 1956 to January 3, 1957 using White Canyon ores. The report contains information on the grinding, leaching, and liquid-solid separation by continuous countercurrent decantation. Detailed information is presented on the liquid-liquid solvent extraction of the leach liquor using organic solvents containing di-2-ethylhexyl phosphoric acid or triisooctyl amine. Results show White Canyon ores to be amenable to the Acid Leach–CCD–Solvent Extraction process. Using di-2-ethylhexyl phosphoric acid, reagent consumptions were relatively high, whereas with triisooctyl amine excellent recovery of uranium was obtained with moderate reagent requirements. (auth)

7147 WIN-70

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

ACID LEACH RESIN-IN-PULP PILOT PLANT TESTING OF MONTICELLO BLEND ORE. A. W. Griffith, M. A. Peters, W. D. Charles, and H. E. Gardner. Mar. 28, 1957. 59p. Contract AT(49-6)-924. $9.30(ph OTS); $3.60 (mf OTS).

Uranium ore from the Monticello, Utah, stockpile consisting of 40% Stockpile 68, 40% Stockpile 56, and 20% Stockpile 30 was treated in the Acid Leach–Resin-In-Pulp Pilot Plant at Grand Junction, Colo. The name Monticello Blend was given the above mixture. Information on leaching, ion exchange, solvent extraction of pregnant eluate, precipitation, and tailing neutralization tests obtained while treating Monticello Blend is presented. From the pilot plant test, it was concluded that the ore is amenable to the Resin-In-Pulp process. (auth)

7148

ANION EXCHANGE IN URANYL SULPHATE SOLUTION. HIGH-CONCENTRATION EFFECTS AND RATE STUDIES. T. V. Arden and Marion Rowley (Permutit Co., Ltd., London). J. Chem. Soc. 1709-13(1957) Apr.

The concentration of U and So_4^{2-} in anion-exchange resins in equilibrium with concentrated solutions of UO_2SO_4, is higher than the saturation values for $UO_2(SO_4)_2^{4-}$, $UO_2(SO_4)^{2+}$ or $U_2O_5(SO_4)_2^{4-}$. The increase may be due to the presence of $U_2O_5(SO_4)_2^{2-}$, or more probably to the permeation of undissociated UO_2SO_4 into the resin, in addition to the normal exchange process. In dilute solution the rate of adsorption

of U decreases with increasing pH, owing to the lower rate of diffusion through the resin of $U_2O_3(SO_4)_3^{4-}$ than $UO_2(SO_4)_3^{4-}$. (auth)

7149

ION EXCHANGE AND ITS APPLICATIONS. London, Society of Chemical Industry, 1955. 173p.

The twenty papers read at conference at London University, England, April, 1954 are presented. Some of the topics discussed are: structure, synthesis, and properties of ion exchange resins; ion exchange equilibria and kinetics; operation of ion exchange columns; and continuous ion-exchange. The analytical, research, and industrial applications of ion exchange are treated. (T.R.H.)

SORPTION PHENOMENA

7150

MOBILITY AND ADSORPTION OF HYDROGEN ON TUNGSTEN. R. Gomer, R. Wortman, and R. Lundy (Univ. of Chicago, Ill.). J. Chem. Phys. 26, 1147-64(1957) May.

The surface diffusion of hydrogen on W field emitters has been investigated by making use of the low vapor pressure and high sticking coefficient of H_2 at liquid helium temperature to obtain unilateral contamination. Average values of the energy of desorption of H_2 have also been obtained. It is found that spreading occurs in three distinct phases. The bearing of these results on the mechanism of some catalytic reactions is discussed. (auth)

7151

IDEALIZED MODELS FOR ADSORPTION FROM SOLUTION. I. VAN DER WAALS ADSORPTION FROM REGULAR SOLUTIONS. Robert S. Hansen and Ursula H. Mai (Ames Lab., Iowa). J. Phys. Chem. 61, 573-7(1957) May.

The theory of ideal van der Waals adsorption from regular solutions of equal sized molecules is developed, and explicit limiting forms for high and low concentrations of preferentially adsorbed components and for slightly soluble systems are given. (auth)

SYNTHESES

7152

AN IMPROVED TECHNIQUE FOR LABELLING PROTEINS WITH I^{131} Alfred Staub, Vivien Springs, and Harold Elrick (Veterns Administration Hospital and Univ. of Colorado School of Medicine, Denver, Colorado). Intern. J. Appl. Radiation Isotopes 2, 59-61(1957) Apr.

TRANSURANIC ELEMENTS AND COMPOUNDS

7153 AEC-tr-2918

THE ATOMIC SPECTRUM OF PLUTONIUM. A. R. Striganov and L. A. Korostyleva (Korostileva). Translated by L. Bovey from Optika i Spektroskopiya 1, 957-64(1956). 6p.

7154 AEC-tr-2919

THE ATOMIC SPECTRUM OF AMERICIUM. M. N. Oganov, A. R. Striganov, and Yu. P. Sobolev. Translated by L. Bovey from Optika i Spektroskopiya 1, 965-71(1956). 3p.

URANIUM AND URANIUM COMPOUNDS

7155 ANL-5700(Pt. A)

Argonne National Lab., Lemont, Ill.

THE THERMAL CONDUCTIVITY OF URANIUM. Karl F. Smith. Apr. 1957. 34p. Contract W-31-109-eng-38. $0.30(OTS).

First in a monograph series sponsored by the Metallurgy Div., ANL.

7156

PRODUCTION OF HIGH PURITY URANIUM POWDER. R. G. Bellamy and J. H. Buddery (A.E.R.E., Harwell). Nuclear Power 2, 175-9(1957) May.

Glove box methods used at Harwell for reduction of uranium oxide with calcium or magnesium are described. Different techniques for large and small scale operations are included. The efficiency and purity of the product are stressed. (M.H.R.)

7157

USE OF RONGALITE IN PRODUCTION OF LOW SOLUBILITY TETRAVALENT URANIUM DERIVATIVES. A. A. Greenberg, et al (Leningrad Radium Inst.). Zhur. Analit. Khim. 12, 92-4(1957) Jan.-Feb. (In Russian)

The reduction of uranyl salts by rongalite is described, and the advantages over the reduction with hydrosulfite are shown. The tetravalent uranium has been quantitatively isolated from the solution of oxalic or hydrofluoric acid, and the optimum concentration conditions for U isolation as an oxalate are given. (tr-auth)

7158

URANIUM DIOXIDE ANODES IN MELTED CHLORIDE ELECTROLYTES. M. V. Smirnov and L. E. Ivanovskiĭ. (Ural Div., Academy of Sciences, U.S.S.S.R.). Zhur. Obshchei Khim. 27, 295-9(1957) Feb. (In Russian)

Electrodes prepared from UO_2 were used as anodes in the electrolysis of fused molten chlorides at current densities up to 3 A/cm^3. Investigations were made of the behavior of UO_2 anodes in molten K and Li chlorides, and polarization of the anodes at 550° was measured. A suggestion has been offered that UO_2 electrodes behave in melts identical to metallic anodes. Their potential can be determined by the UO_2^{++} mole-mg concentration in electrolyte. (R.V.J.)

WASTE DISPOSAL

7159 HW-48916

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

HYDRAULIC CHARACTERISTICS OF HANFORD AQUIFERS. William H. Bierschenk. Mar. 3, 1957. 38p. Contract W-31-109-Eng-52. $0.30(OTS).

Three analytical techniques were applied to data from aquifer tests at Hanford to determine the hydraulic characteristics of the ground-water reservoirs. These techniques are the nonequilibrium type-curve method, the modified nonequilibrium straight-line method, and the image well technique for analyzing an aquifer of limited areal extent. The selection of equations and their application in the analysis of test data were governed largely by the physical conditions of the aquifers at the test sites studied. Data are presented graphically. (auth)

7160 HW-49195

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

THE TURBULENT DIFFUSION OF RIVER CONTAMINANTS. H. T. Norton. Mar. 25, 1957. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Both a theoretical and an empirical approach were pursued toward defining the turbulent diffusion process encountered in the Columbia River. The merits and limitations of each approach are discussed. Although no solution was obtained for the differential equation encountered in the theoretical development, its derivation is included for the benefit of those interested in further study of this or a similar problem. The empirical approach is completely

outlined and gives an adequate fit to the available data. However, it cannot be extended to conditions not defined by the data without additional experimental work which is outlined. (auth)

ENGINEERING

7161 HW-40980

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

PUREX REMOTE STUDS. Carl F. Yuenger. Jan. 19, 1956. 6p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The failure of some remote flange connecting studs in Purex Process lines is discussed. Failures are attributed to embrittlement by welding, and in another case, to inferior heat treating of the stainless steel. It is recommended for future installations that an optimum material be found and specifications be more rigid. (T.R.H.)

HEAT TRANSFER AND FLUID FLOW

7162 HW-41860

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

STUDIES ON THE HYDRAULIC CHARACTERISTICS OF PUREX OFF-GAS JETS. L. R. Michels. Mar. 14, 1956. 27p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

7163 JPL-Memo-20-137

California Inst. of Tech., Pasadena. Jet Propulsion Lab.

SUMMARY OF CONFERENCE ON BUBBLE DYNAMICS AND BOILING HEAT TRANSFER HELD AT THE JET PROPULSION LABORATORY, JUNE 14 AND 15, 1956. S. G. Bankoff, W. J. Colahan, Jr., and D. R. Bartz. Dec. 10, 1956. 52p. Contract DA-04-495-Ord-18.

A meeting was arranged to bring together recent contributors in the field of boiling heat transfer. The points of agreement and difference in the several analyses and correlations reported in the literature were discussed, and the areas which require more extensive experimentation and theoretical treatment were indicated. (D.E.B.)

7164 NP-6156(Add.)

Mine Safety Appliances Co., Gallery, Penna.

TWO TUBE STEAM EVAPORATOR NO. 3. Technical Report No. 51. Addendum. W. Milich, E. A. Schultz, and E. C. King. May 22, 1957. 22p. Contract NObs-65426.

A previously tested two tube steam evaporator of $2\frac{1}{4}\%$ Cr–1% Mo steel with a gas filled third fluid leak monitoring system (duplex tube) was removed from the system upon completion of a cyclic program and shipped to Griscom-Russell for re-expanding the inner tube of the duplex tubes. When it was returned, the evaporator was re-installed in the test loop system and subjected to a testing program to determine the effectiveness of the tube expansion and the effect of accelerated creep on the performance. A series of steady state runs were first made to check the effectiveness of re-expansion on heat transfer performance, after which the evaporator was subjected to an accelerated creep test for 400 hours generating steam at 500 psig with an inlet NaK temperature of 1010°F and nitrogen third fluid at a pressure of 200 psig. The steady state runs were then repeated to determine the effect of any creep on the evaporator. The total steaming time of the evaporator both before and after re-expansion of the tubes was 3856 hours. Steady state test data obtained using helium for the third fluid indicated the unit was restored to its original efficiency with an over-all U of approximately 760 Btu/hr-sq ft-°F at 60% NaK flow (2100 lb/hr-tube). Because of the increased tightness of the duplex tube bond, the nature of the third fluid gas had much less effect on performance than during earlier tests. In the original test program the performance with helium as the third fluid was approximately 25% greater than with nitrogen; it was only 4.8% greater during this phase of the test program. There was a gradual 6.6% increase in the U of the evaporator over the 400 hour accelerated creep test period. The evaporator has been shipped to KAPL for detailed metallurgical examination, which may offer some explanation of the rise in U during the creep test. These tests indicate that if the performance falls off as a result of severe thermal cycling, it can be regained by re-expanding the inner tube of a duplex tube evaporator. (auth)

7165 NP-6250

Brown Univ., Providence. [Graduate] Div. of Applied Mathematics.

AN ATTEMPT TO GENERALIZE ONSAGER'S PRINCIPLE AND ITS SIGNIFICANCE FOR RHEOLOGICAL PROBLEMS. Technical Report No. 13 [Covering] Period October 1956–March 1957. Hans Ziegler. Mar. 1957. 28p. Project title: APPLICATION OF INVARIANCE PRINCIPLES IN CONTINUUM MECHANICS. Contract DA-19-020-ORD-3487.

7166 ORNL-2294

Oak Ridge National Lab., Tenn.

AN EXPERIMENTAL STUDY OF TRANSIENT BOILING. M. W. Rosenthal and R. L. Miller. May 24, 1957. 40p. Contract W-7405-Eng-26. $0.30(OTS).

An experimental investigation of heat transfer to subcooled water under transient conditions has been conducted. Heat was generated electrically in platinum and aluminum ribbons in such a manner as to produce exponentially increasing heat generation rates which simulated reactor excursions. Surface temperature was measured and the events were photographed with a high-speed camera. The temperature attained by the surface before boiling commenced was determined and the time delay between passage of the boiling point and the beginning of boiling was measured. Heat flux at the beginning of film boiling was obtained. The effects of water temperature, exponential period, and gas concentration were studied. Periods ranged from 5 to 75 milliseconds. The bulk water temperature was varied from 90°F to near the boiling point; in all experiments the water was initially stagnant and at atmospheric pressure. (auth)

7167 WCAP-299

Westinghouse Electric Corp. Commercial Atomic Power, Pittsburgh.

SLURRY CHARACTERIZATION—RHEOLOGY. J. S. Rensen. Sept. 26, 1956. 27p. PAR Project. $4.80 (ph OTS); $2.70(mf OTS).

Viscometric data are given for pumped ThO_2 slurries, Waring Blendored slurries, autoclaved slurry, chemically dispersed slurries and evaluation of the viscometer as an absolute instrument by determination of the viscosity of water within 0.7%. Data are presented which would indicate the absence of thixotropy in the slurries considered. Photomicrographs are included which graphically portray the structural changes produced by the various treatments above. (auth)

7168 AEC-tr-2920

THE AERODYNAMIC BEARING. G. Heinrich. Translated by R. Todd from Maschinenb. u. Wärmewirtsch. 7, 129-35 (1952). 15p.

Various forms of flow bearings were studied. The theory

of flow bearings with a compressible working fluid (air) was developed. The general differential equation for the flow of compressible films was derived and the cylindrical load bearing with laminar and with turbulent flow was determined. The optimum quantities, i.e., those which correspond to the smallest value for the energy of the compressor, were calculated, and the method of calculation was demonstrated by numerical examples. Finally the double sided, annular tracked bearing was dealt with and formulas for the average bearing pressure and the energy necessary for the compressor were derived. By means of a numerical example, it was shown how the quantities corresponding to a minimum energy requirement are determined. (tr-auth)

MATERIALS TESTING

7169 WADC-TR-56-486

Battelle Memorial Inst., Columbus, Ohio.

EVALUATION OF POROUS MATERIALS FOR BOUNDARY-LAYER CONTROL. [Period covered] November 1954 to September 1956. David E. Debeau. Sept. 1956. 162p. Project title: METALLIC MATERIALS. Task title: HIGH-TEMPERATURE ALLOYS. Contract AF33(600)-28835. (AD-110582; PB-121851). $4.00(OTS).

Criteria were determined from designers for comparing various commercial permeable sheet materials for use in boundary-layer control associated with high-lift systems. Sintered metal powders, special woven and sintered wire materials, a compressed glass-fiber product, woven wire cloths, and perforated metal sheets were evaluated and compared for the following properties: average permeability, uniformity of permeability, resistance to clogging and corrosion, mechanical properties including room temperature tensile strength, modulus of elasticity, Poisson's ratio, and minimum bend radius. An evaluation of economic factors, including production facilities, product limitations, requirements for and availability of raw materials, and cost of product, was carried out on those permeable sheet materials which attained most nearly the physical and mechanical properties desired by the aircraft designers. (auth)

PUMPS

7170 IDO-14398

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

FACTORS AFFECTING CAPACITY OF AIR LIFTS. H. V. Chamberlain. Mar. 18, 1957. 44p. Contract AT(10-1)-205. $0.30(OTS).

An investigation of the operation of air lifts was made to develop feasibility of application to nuclear fuel processing facilities. The effect of the following variables on lift capacity was studied: pipe diameter, submergence ratio, liquid density, liquid temperature, nozzle design, nozzle holder design, eductor shape, and viscosity. Three of the variables had major effects; i.e., pipe diameter, submergence ratio, and liquid temperature. The remaining variables had a negligible effect on lift capacity. It was found that the lift capacity increased as the pipe diameter and submergence ratio increased. An increase in liquid temperature increases the lift capacity if the air rate for maximum liquid flow has not been exceeded; otherwise the increased liquid temperature causes a decrease in lift capacity. If the data are plotted using the weight basis for liquid flow there is no effect of liquid density. However, when plotted on the volume basis the lift capacity is seen to vary inversely with the density of the liquid. The nozzle designs used here attempted to vary the size of the air bubbles entering the liquid stream. Nozzle design as studied here had no effect on the lift capacity. The flow of liquid from the horizontal run of pipe into the eductor does not have to be relatively smooth. The difference between smooth and turbulent entrance effects is negligible. There were no indications of the nozzle plugging when lifting a hot, concentrated salt solution. Although the effect of viscosity could not be studied independently it can be deduced from the data obtained that viscosity has a negligible effect on lift capacity over the range studied (aqueous salt solutions). The air lift pumps in operation during this investigation have proven themselves to be maintenance-free and very dependable. (auth)

7171 AEC-tr-2708

ON THE THEORY OF STEAM-JET VACUUM PUMPS. I. M. Lifshits and L. N. Rozentsveig. Translated from Zhur. Tekh. Fiz. 25, 1323-5(1955). 3p.

RADIOGRAPHY

7172

INDUSTRIAL RADIOGRAPHY BY GAMMA-RAY PROJECTION FROM RADIOACTIVE ISOTOPES. Charles M. Dick (Metal & Thermit Corp., Rahway, N. J.). Welding J. (N. Y.) 36, 457-62(1957) May.

Radiographic inspection of welded joints and castings in general industrial practice as well as in military specifications is discussed. (auth)

TRACER APPLICATIONS

7173

A RADIOACTIVITY METHOD FOR MEASURING WEAR IN BALL BEARINGS. Ulf S. Landergren. Intern. J. Appl. Radiation Isotopes 2, 86-8(1957) Apr.

7174

A METHOD FOR MEASURING TERMINAL VELOCITY AND SPECIFIC GRAVITY OF RADIOACTIVE PARTICLES. F. E. Adley and R. H. Scott (General Electric Co., Richland, Wash.). Intern. J. Appl. Radiation Isotopes 2, 88-9(1957) Apr.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

7175 AECU-3471

Sandia Corp., Albuquerque, N. Mex.

A COMPARISON OF SOME PIEZOELECTRIC CERAMICS. R. L. Barger and J. M. Canfield. Feb. 1, 1957. 12p. Contract [AT(29-1)-789]. (TM-30-57-14). $3.30(ph OTS); $2.40(mf OTS).

This memorandum summarizes some of the basic physical properties of barium titanate, lead-zirconate titanate, and lead metaniobate which are of importance to the use of these materials as piezoelectric transducers. The advantages and disadvantages of each material are discussed with graphical displays of physical characteristics presented to point out the variations between materials. Emphasis is placed on the advantages of lead metaniobate due to its extended temperature range of operation and on the importance of further work to improve the quality of this material. (auth)

7176 HER-H4/52

Gt. Brit. Ministry of Supply. Materials Research Div. (High Explosives Research), Fort Halstead, Kent, England.

REVIEW OF THE REFRACTORY SULPHIDES. THE PREPARATION OF CERIUM SESQUISULPHIDE CERAMICS. W. J. Kramers. June 1952. 35p.

The various refractory sulfides are reviewed and a simple method for the preparation of cerium sesquisulfide is described in detail. Methods suitable for the molding and sintering of sulfide powders into ceramic crucibles are summarized. A new type of crucible extrusion mold has been developed and experiments are described on the preparation of sintered cerium sesquisulfide crucibles. A preliminary survey has been made of the factors likely to affect the amount of contamination caused to a liquid metal by interaction with a crucible. (auth)

7177 HER-H5/52

Gt. Brit. Ministry of Supply. Materials Research Div. (High Explosives Research), Fort Halstead, Kent, England.

REVIEW OF THE REFRACTORY SULPHIDES. THE PREPARATION OF CERIUM MONOSULPHIDE CERAMICS. W. J. Kramers, J. R. Stevens, and F. Dennard. June 1952. 34p.

Cerium monosulphide has been prepared by treatment of a mixture of cerium sesquisulphide and cerium hydride at high temperatures under high vacuum. A special furnace was designed for these experiments and temperatures exceeding 2000°C have been reached at a pressure of less than 2×10^{-4} mm. A new quantitative microscopic method has been developed for the estimation of impurities in the cerium monosulphide. Various shapes have been molded in the material prepared and sintered under high vacuum. (auth)

7178 HER-H21/51

Gt. Brit. Ministry of Supply. Materials Research Div. (High Explosives Research), Fort Halstead, Kent, England.

ABNORMALLY CONDUCTING CERAMICS. SOME EXPLORATORY EXPERIMENTS ON THE ELECTRICAL CONDUCTIVITY OF CERIUM SESQUISULPHIDE. W. J. Kramers. Nov. 1951. 22p.

Cerium sulfide in the cubic structured phase which extends over the composition range $Ce_2S_3-Ce_3S_4$ is an example of a semiconducting ceramic. Some exploratory experiments on the influence of factors affecting the electrical conductivity in the Ce_2S_3 region are described. The conductivity is relatively small, but the material may be a useful semiconductor for electrical devices. (auth)

7179 PWAC-167

Pratt an Whitney Aircraft Div., United Aircraft Corp., Hartford, Conn.

SUMMARY PROGRESS REPORT ON AN INVESTIGATION OF THE MANUFACTURE OF HIGH-DENSITY BERYLLIUM OXIDE PARTS BY THE BRUSH BERYLLIUM COMPANY. Apr. 5, 1957. 29p. Fox Project. Contracts AF33(038)-27340 and AT(11-1)-229. $0.25(OTS).

Methods for manufacturing high-density BeO parts, particularly shapes ranging from $^1/_4$-in. diameter rounds to 1- by 2-in. rectangular sections, in lengths from 5 to 30 in. are described. Fabrication techniques considered for producing these shapes included conventional ceramic-forming technique of dry-pressing and extrusion, which are followed by firing to a high temperature, and also hot-pressing method of fabricating directly to shape. (W.L.H.)

7180 WADC-TR-56-329

Sylvania Electric Products Inc. Bayside, N. Y.

IMPROVEMENT OF THE IMPACT RESISTANCE OF CERMETS. [Period covered] May 1, 1955 to May 1, 1956. A. C. Pezzi and H. P. Kling. Aug. 13, 1956. 32p. Project title: CERAMIC AND CERMET MATERIALS. Task title: CERAMIC AND CERMET MATERIALS DEVELOPMENT. Contract AF33(616)-2911. (AD-118195).

The possibility of improving the impact resistance of cermets by the application of a well bonded ductile metallic coating to the surface was investigated. Commercially available bars of K161B were used as a base cermet. Coating methods investigated included diffusion bonding of electrodeposited Ni, infiltration of porous sintered coatings, direct application of high temperature brazes, diffusion bonding to shaped tubing and vacuum casting. The application of 0.018-in. of electrodeposited Ni, bonded by a suitable vacuum heat treatment, raised the impact strength from values of 2.56 and 3.36 in.-lbs at room temperature and 1800°F respectively to values of 21.48 and 18.96 in.-lbs at the same temperatures. Limited test results indicated that diffusion bonding of shaped tubing also raised the impact strength appreciably. The infiltrated coatings showed promising structures when examined metallographically but the impact strength was essentially unchanged with the compositions used. It is possible that other compositions might be more beneficial. The direct application of brazing alloys was deemed unsatisfactory. The vacuum cast coatings had interesting microstructures but were not evaluated. (auth)

7181 AEC-tr-2907

THE INFLUENCE OF MECHANICAL PRESSURE ON DIELECTRIC PROPERTIES OF FERROELECTRIC CERAMICS. (Vliyaniye Mekhanicheskogo Davleniya na Dielektricheskiye Svoistva Segnetokeramiki.) E. V. Sinyakov and I. A. Izhak. Translated from Doklady Akad. Nauk S.S.S.R. 100, 243-6 (1955). 9p.

The dielectric permeability of barium titanate as a function of hydrostatic pressure was studied. The investigations, carried out within a wide range of pressures, showed that the dielectric permeability augments with the increase of pressure, whereby the relative change of the permeability under pressures of from 300 atm to 2000 atm, amounts to $1.2 \cdot 10^{-5}$ cm^2/kg. Experiments with monocrystalline samples have established that the Curie point of $BaTiO_3$, when subjected to growing hydrostatic pressure, shifts toward the lower temperatures, of the order of magnitude of $-5.8 \cdot 10^{-3}$ degree/atm, whereas the peak dielectric permeability, temperaturewise, rises with mounting pressure. A study of the dependence of the above dielectric properties on unilateral (one-sided) pressure is presented. The basic results of the research are listed. (auth)

7182

CHEMISTRY AND TECHNOLOGY OF SILICATES IN CHINA. P. P. Budnikov, and V. P. Barzakovskiĭ. Vestnik Akad. Nauk S.S.S.R. 27, 74-9(1957) Feb. (In Russian)

A review is given of the ceramic research and industrial development in China. (R.V.J.)

CORROSION

7183 AECU-3432

Oregon. Univ., Eugene.

ANODIC OXIDATION OF ZIRCONIUM AT LOW POTENTIALS: EFFECT OF ELECTROLYTE COMPOSITION. George B. Adams, Jr., Curtis E. Borchers, and Pierre Van Rysselberghe. Mar. 1, 1957. 23p. Contract [AT(45-1)-535]. $0.25(OTS).

7184 ANL-5662

Argonne National Lab., Lemont, Ill.

CORROSION OF MATERIALS IN THE PRESENCE OF FLUORINE AT ELEVATED TEMPERATURES. Martin J

Steindler and Richard C. Vogel. Jan. 1957. 22p. Contract W-31-109-eng-38. $0.25(OTS).

In development of materials of construction for the Fluoride Volatility Process, corrosion tests in F_2 at high temperatures were run on Ni, Ni alloys, Copper, CaF_2, and Al_2O_3. These results are presented and compared with results of other investigators on Al, stainless steels, steel sheet, and Armco iron. (T.R.H.)

7185 BM-RI-5299

Bureau of Mines.

THE RELATIVE CORROSION RESISTANCE OF TITANIUM AND SOME OF ITS ALLOYS. Lex B. Golden, Walter L. Acherman, and David Schlain. Feb. 1956. 28p.

Arc-melted and powder-metallurgy Ti and the Ti-7% Mn, Ti-1.8% Cr-0.9% Fe, and Ti-2.7% V-2.7% Fe alloys all have corrosion properties in acids and in chloride solutions that are quite similar; however, there are some differences in the corrosion behavior of these metals. Arc-melted Ti is slightly superior to Ti consolidated by powder-metallurgy techniques in its resistance to H_2SO_4 and H_3PO_4 solutions. The Ti-V-Fe alloy is a little more resistant than unalloyed Ti in some acid solutions, and the Ti-Mn and Ti-Cr-Fe alloys are usually less resistant. The Ti-Mn, Ti-Cr-Fe, and Ti-V-Fe alloys become embrittled in the more concentrated acid solutions. The degree of embrittlement is usually proportional to the corrosion rate. The addition of Zr to Ti greatly increases the corrosion resistance of Ti in H_2SO_4 and HCl solutions and, to a lesser extent, in H_3PO_4 solutions. As little as 14% of Zr is effective, and larger percentages produce progressively better resistance. (auth)

7186

STATIC AND DYNAMIC CORROSION AND MASS TRANSFER IN LIQUID METAL SYSTEMS. Leo F. Epstein (Knolls Atomic Power Lab., Schenectady, N. Y.). Chem. Eng. Progr. 53, Symposium Ser. No. 20, 67-81(1957).

In many systems involving liquid metals, the principal mechanism of corrosion of a solid exposed to the fluid is simple solution. In a static isothermal assembly the rate of corrosive attack is determined by the classical theory involving the solution rate constant α. The value of this parameter depends on whether the rate-determining step is (1) the diffusion of the solute through the liquid or (2) transfer of the solute through a solid film or some product of chemical reaction at the solid–liquid interface. In dynamic corrosion, such as is encountered in heat transfer loops, where parts of the system are at different temperatures and the fluid flows continually from the hot to the cold zone, different expressions are obtained for the corrosion rate depending on whether mechanism 1 or 2 is more important. These results are examined for a few solid–liquid metal systems, and quantitative relations capable of yielding order-of-magnitude agreement with experiment are obtained. The material dissolved in the hot zone of a heat transfer loop tends to deposit out of solution in the cold zone, resulting in an over-all transport of material. Factors influencing this mass transfer rate are examined. The effects of minor impurities in the solvent in accelerating and inhibiting corrosion are discussed. (auth)

7187

CORROSION OF REFRACTORY MATERIALS IN MELTS. I. A METHOD FOR QUANTITATIVE MEASUREMENTS OF THE DISSOLUTION OF REFRACTORY MATERIALS IN MELTS BY USE OF RADIOACTIVE ISOTOPES. H. Flood and A. Seltveit. Kgl. Norske Videnskab. Selskads. Forh. 28, 150-3(1955).

A method of testing the corrosion resistance of refractories is described. Small rods of refractory material are irradiated in a U pile, and then corroded in a melt. The dissolution of the rod is followed by measuring the increase of the radioactivity of the melt. This method makes it possible to examine in a simple way the rate of corrosion as a function of time. (auth)

7188

CORROSION OF REFRACTORY MATERIALS IN MELTS. II. A COMPARATIVE STUDY OF CORUNDUM AND SPINEL BY USE OF RADIOACTIVE ISOTOPES. H. Flood and A. Seltveit. Kgl. Norske Videnskab. Selskads. Forh. 28, 154-60(1955).

The corrosion resistance of corundum and spinel in sodium borate melts has been measured by use of radioactive isotopes introduced in the refractory material. Sodium borates were chosen because the boron anomaly makes it possible in certain temperature intervals to use 3 melts with different Na_2O content but the same viscosity at the same temperature. The results indicate that the corrosion is normally a linear function of time, and at constant viscosity increases with increasing sodium-oxide content in the melt. This tendency is more pronounced for corundum than for spinel. Some measurements of the activation energy have also been made, and these results seem to indicate that the rate-determining process is a cation diffusion through the border layer between refractory and melt. (auth)

7189

SODIUM CORROSION AND OXIDATION RESISTANCE OF HIGH-TEMPERATURE BRAZING ALLOYS. G. M. Slaughter, C. F. Leitten, Jr., P. Patriarca, E. E. Hoffman, and W. D. Manly (Oak Ridge National Lab., Tenn.). Welding J. (N. Y.) 36, 217s-25s(1957) May.

Many of the brazing alloys which were investigated possessed excellent resistance to sodium corrosion and oxidation. Alloy systems of the Ni–Si–B, Ni–Cr–Si–B, and Ni–Cr–Si types were found to be compatible in both media. Precious-metal alloys were, in general, severely attacked by sodium, as were many of the silicon-free, chromium-free, phosphorus-bearing alloys. Alloys containing manganese, tin or copper exhibited poor resistance to oxidation at 1500°F. In most cases, oxidation was more pronounced at 1700°F. (auth)

GEOLOGY AND MINERALOGY

7190 NYO-3363

Pennsylvania State Coll., University Park. Mineral Industries Experiment Station.

AN INVESTIGATION OF THE MINERALOGY, PETROGRAPHY AND PALEOBOTANY OF URANIUM-BEARING SHALES AND LIGNITES. (SCOPE A—SHALES). Second Annual Report [for] Period of April 1, 1952 to March 31, 1953. 44p. Project No. E-32. Contract AT(30-1)-1202. $7.80(ph OTS); $3.30(mf OTS).

7191 RME-2045

Salt Lake Area Office, AEC.

PRELIMINARY REPORT ON THE URANIUM OCCURRENCE OF THE GREEN VELVET CLAIMS, INYO COUNTY, CALIFORNIA. Donald L. Hetland. Oct. 1955. 18p. $0.30(OTS).

Several U occurrences were discovered in the Coso lake beds, Owens Valley, Calif., along the west flank of the Coso Range. The most significant deposit is situated on the Green Velvet claims 4.3 miles east of Olancha. Autunite occurs on fracture surfaces and in Fe-stained zones and has been traced laterally for 2,200 ft. Select samples contain ore-grade material. (auth)

7192 RMO-2803
Colorado School of Mines Research Foundation, [Inc.]. Golden.
RECOVERY OF URANIUM VALUES FROM ORE AND CONCENTRATE SAMPLES. Progress Report No. 3. June 30, 1955. 53p. CSMRF Project No. 530208. Contract AT(49-6)-916. $0.40(OTS).

The objective of the phase of the project reported was to improve the flotation process which had been developed for the Beaverlodge ore. It was indicated that a concentrate containing a minimum of 0.25% U_3O_8 and a recovery of 80% of the U values would have economic significance and could be considered as the objective of this investigation. The objective of the project as a whole is to develop an improved process for concentrating the Beaverlodge U ore. The scope of the investigation is unlimited insofar as ore-dressing methods are concerned. (auth)

METALS AND METALLURGY

7193 HW-49460
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
CONSUMABLE ELECTRODE PROJECT. W. I. Steinkamp. Mar. 20, 1957. 8p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

An investigation was made to determine the feasibility of producing satisfactory fuel element closures by the consumable electrode welding process. The consumable electrode or inert gas shielded metal arc process is a semi-automatic process wherein wire is used as the electrode and is fed by drive rolls into the arc as fast as it is consumed and deposited as weld bead. High current densities and arc forces cause this metal transfer to form a spray of minute molten particles. Although the arc is shielded by an envelope of inert gas, a small quantity of vaporized metal reaches the air and deposits as a soot alongside the weld bead. This deposit seems to cause porosity when a circular weld closes on itself. (auth)

7194 NP-6286
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
NOTES ON TITANIUM FASTENERS. Morris Mote. Apr. 11, 1957. 15p.

An outline of the fabrication methods for titanium fasteners is given. Centerless-ground bar stock is cut into the desired lengths and the ends are dressed. The head end is heated, usually by induction, to the forging temperature and is upset. The blank is heat treated or annealed to a minimum of 150,000-psi tensile strength. The blank is descaled and all critical surfaces (head-to-shank fillet, shank and reduced section) polished. The thread end is cold reduced by extrusion, machining, or possibly by rolling, to provide the necessary diameter for thread rolling. Threads are rolled cold, and the head-to-shank fillet is cold rolled. Details of these procedures differ in several respects from similar operations performed on high-strength steel because of the peculiarities of titanium and its alloys. Some of the production conditions that require special attention are given. (auth)

7195 NP-6291
Metallurgical Advisory Committee on Titanium.
MINUTES OF TITANIUM SYMPOSIUM ON HEAT TREATING AND ALLOYING HELD AT CASE INSTITUTE OF TECHNOLOGY, CLEVELAND, OHIO, NOVEMBER 7 AND 8, 1956. 72p.

Developments in alloying, heat treatment, effects of heat treatment, mechanical properties, structure, and effects of H_2 content, regarding Ti alloys, are reported and discussed. Abstracts of 24 papers are presented and the discussion of each paper is recorded. (T.R.H.)

7196 NP-6292
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
DEVELOPMENT OF OXIDATION AND LIQUID SODIUM RESISTANT BRAZING ALLOYS. Quarterly Report No. 3 [for] January 15, 1957 to April 15, 1957. Domenic A. Canonico and Harry Schwartzbart. Apr. 22, 1957. 9p. ARF Project No. B-110. Contract AF33(600)-33406.

A program is in progress at Armour Research Foundation which has as its objectives: the development of filler metals for brazing stainless steel to Inconel, the brazements to be resistant to oxidation and attack by molten sodium at 1650°F, and the development of a simple test for the ductility of a brazement. Atmospheric difficulties have been encountered during the brazing of T-specimens. A titanium sponge furnace has been added to the purification train in an attempt to eliminate this problem. Approximate melting temperatures have been obtained for 50 out of the 55 alloys originally proposed. Twelve alloys melted below 1900°F. Fifteen additional alloys have been prepared and are under study. These new alloys have as their base four alloys previously studied that had melting points above the maximum permissible temperature. Indium and/or silicon have been added as temperature depressants. (auth)

7197 NYO-7916
Aeroprojects, Inc., West Chester, Penna.
APPLICATIONS OF ULTRASONIC ENERGY. Progress Report No. 2 Covering Period from December 16, 1956 to February 15, 1957. Apr. 1957. 24p. Contract AT(30-1)-1836. $4.80(ph OTS); $2.70(mf OTS).

Significant increase in dissolution rates of Type 304 stainless steel and of Zircaloy-2 was observed as a direct result of ultrasonic treatment. Investigation of the effect of temperature on the ultrasonic dissolution rate of stainless steel indicated a minor increase in rate with increased temperature. An ultrasonic controlled-atmosphere furnace has been designed to permit treatment of melts of thorium bismuthide varying in depth from $^1/_{32}$ inch to 2 inches. Fabrication of the furnace is about one-third complete. Ultrasonic transducer-coupler-punch systems for treatment of powdered metal compacts have been designed and partially fabricated for installation in a 100-ton hydraulic press, and much of the auxiliary equipment has been assembled. Metal powders to be used in the experimental investigation have been procured. (auth)

7198 ORNL-2296
Oak Ridge National Lab., Tenn.
ANODIZING AS A METALLOGRAPHIC TECHNIQUE FOR ZIRCONIUM BASE ALLOYS. M. L. Picklesimer. May 24, 1957. 17p. Contract W-7405-eng-26. $0.20(OTS).

The anodizing technique and solution have been shown to be useful in phase identification, in providing color contrast of microstructures, increased anistropy in polarized light, and as a preservative for etched surfaces for the metallographic examination of Zr base alloys. The technique has also been used on U and Ti base alloys. (auth)

7199 TML-69
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
NOTCH SENSITIVITY OF TITANIUM AND TITANIUM ALLOYS. F. C. Holden. Apr. 26, 1957. 93p. Contract AF18(600)-1375.

The notch properties of Ti and Ti alloys are reported. The results of a number of test programs are presented and discussed in terms of present knowledge of the mode of failure in notched specimens. Recommendations are made for further fundamental studies of notch sensitivity. (auth)

7200 AEC-tr-2921

REDUCTION OF NICKEL BY HYPOPHOSPHITE. I. FORMATION CONDITIONS AND SOME PLATING PROPERTIES. II. PROBLEMS OF THE REACTION MECHANISM. K. M. Gorbunov and A. A. Nikiforov. Translated from Zhur. Fiz. Khim. 28, 883-901(1954). 21p.

The process of chemical nickel reduction from solutions containing hypophosphite resulting in the formation of dense brilliant platings of arbitrary thickness on surfaces catalyzing this reaction is studied in great detail. The material compiled up to the present characterizing conditions of this complex catalytic reaction may be considered on the basis that the first step of the process is a hypophosphite decomposition with formation of atomic H which reduces Ni. The parallel reactions occur forming molecular H leading to its evolution in a gaseous form and the reaction of atomic H on hypophosphite with the formation of elemental P which interacts with Ni in its formation process. (auth)

7201 IGRL-T/R-21

ON THE METHOD OF EXTRAPOLATION OF CREEP TEST DATA. V. S. Ivanova. Translated by E. Bevitt from Teploenergetika 3, 26-8(1956). 6p.

Comparison of experimental data shows that the connection between stress and creep rate of various steel compositions is expressed most accurately not by the widely adopted power relationship but by an exponential dependence. (auth)

7202

ELECTRICAL RESISTIVITY OF NICKEL–PALLADIUM ALLOYS. A. W. Overhauser and A. I. Schindler (Naval Research Lab., Washington). J. Appl. Phys. 28, 544-6 (1957) May.

The concentration dependence of the residual resistivity of Ni–Pd alloys might be expected to obey a simple Nordheim law since the number of holes in the d band and the number of electrons in the s band are approximately independent of composition. Measurements have indicated, however, that the maximum resistivity occurs at 70 atomic percent Pd instead of 50%. This behavior can be explained by the spin dependence of electron scattering processes associated with the fact that the alloys with greater than 3% Ni are ferromagnetic. Quantitative fit of the data is possible if it is assumed that the density of states at the Fermi energy in the d band is approximately proportional to the number of holes, rather than to the cube root of this number. Data on the resistivity and paramagnetic susceptibility of Ag–Pd alloys support this hypothesis. The relative strength of s–d scattering to s–s scattering must be assumed to be about 5:1. (auth)

7203

MAGNETIC DOMAIN PATTERNS ON THIN FILMS. H. J. Williams and R. C. Sherwood (Bell Telephone Labs., Murray Hill, N. J.). J. Appl. Phys. 28, 548-55(1957) May.

Magnetic domain patterns have been observed on evaporated films of iron, cobalt, nickel, and several different alloys of these elements. The films were deposited in the presence of a magnetic field to establish a uniaxial direction of easy magnetization, in films of all compositions, could be changed by re-heat-treating them in a magnetic field with a new orientation. This is of special interest because bulk specimens of the elements do not respond to heat treatment in a magnetic field. Nucleation and growth of domains were observed for fields applied at various angles to the uniaxial direction of easy magnetization in some of the films. Patterns were obtained on films ranging in thickness from approximately 50 to 12000 A. Domain walls in films ranging from 50 to 500 A in thickness tend to aggregate in pairs. (auth)

7204

EFFECT OF STRAIN AND TEMPERATURE ON THE YIELDING OF COPPER AND NICKEL. J. H. Frye, Jr., L. L. Scott, and J. W. Woods (Oak Ridge National Lab., Tenn.). J. of Metals 9, 708(1957) May.

7205

LOW TEMPERATURE HEAT CAPACITIES AND RELATED PROPERTIES OF POTASSIUM AND Na_2K. C. A. Krier, R. S. Craig, and W. E. Wallace (Univ. of Pittsburgh). J. Phys. Chem. 61, 522-9(1957) May.

Constant pressure heat capacities between 12 and 320°K are presented for K and an alloy of composition Na_2K. The Na_2K–K eutectic point was established to be −12.65 ± 0.01°, and the incongruent melting point or meritectic point for Na_2K was established to be 6.90 ± 0.00°. From the heat capacity data the entropies at 273.16 and 298.16°K, relative to absolute zero, are found to be, 14.77 ± 0.03 and 15.38 ± 0.03 e.u./g. atom for potassium, and 12.48 ± 0.02 and 16.07 ± 0.03 e.u./g. atom for Na_2K, respectively. A residual entropy for Na_2K at absolute zero was estimated, assuming an ideal entropy of mixing, to be −0.05 e.u./g atom; this result suggests that the entropy of formation of Na_2K exceeds the ideal mixing entropy. (auth)

7206

MOLYBDENUM FOR HIGH STRENGTH AT HIGH TEMPERATURES. Robert R. Freeman and J. Z. Briggs (Climax Molybdenum Co., New York). Jet Propulsion 27, No. 2, 138-47(1957) Feb.

A study is presented of the progress made on the application of molybdenum in missile and powerplant design. Tables of metallurgical properties at high temperatures are included. (J.E.D.)

7207

SOME PROPERTIES OF NEPTUNIUM METAL. V. W. Eldred and G. C. Curtis (Windscale Works, Sellafield, Cumberland). Nature 179, 910(1957) May 4.

7208

STRUCTURE OF LIQUID METALS. I. V. Radchenko. Uspekhi Fiz. Nauk 61, 249-76(1957) Feb. (In Russian)

Roentgenographic and neutronographic investigations showed that the atomic packing in liquid metals is related to the atomic packing in the solid state, however the character of such bond depends on the type of the metal. The coordination number of all metals either increases or changes. The indication of reduced coordination numbers for Pb, Tl, and In was not sufficiently substantiated due to the side maximum appearing on the atomic distribution curve. This could be an error incurred in developing the intensity distribution curves. The temperature relations of the intensity curves of K, Tl, Sn and other metals show that liquid metals retain their type of packing at considerably higher temperatures than the melting point. (R.V.J.)

7209

TITANIUM, TITANIUM ALLOYS, AND THEIR AREAS OF APPLICATION. N. T. Gudtsov, L. D. Mashtakova. Vestnik Akad. Nauk S.S.S.R. 27, 59-68(1957) Feb. (In Russian)

A review of thermal, technological, and physical properties of Ti, and its alloys and their uses are discussed. (R.V.J.)

PHYSICS

7210 ISC-729

Ames Lab., Ames, Iowa.

FERROMAGNETIC-ANTIFERROMAGNETIC PHASE TRANSITIONS. Thomas James Hendrickson and J. M. Keller. Mar. 1956. 125p. Contract W-7405-Eng-82. $0.60(OTS).

The problem of ferromagnetic-antiferromagnetic phase transitions for a system in which the angular momentum per atom has the magnitude J is studied in the molecular field approximation. Both ferromagnetic and antiferromagnetic interatomic interactions, which are slightly temperature dependent, are assumed to exist between certain nearby neighbor atoms. An anisotropy energy is introduced of the form which arises from the effect of crystal fields. The structure is subdivided into sublattices, and the partition function Z is derived. From Z are obtained the free energy F and the equations which determine the average angular momentum per atom of each of the sublattices. The following results are obtained for polycrystalline dysprosium. The experimentally measured susceptibility, which for a polycrystalline sample is a weighted average of the susceptibilities parallel and perpendicular to the preferred axis in a single crystal, goes through a minimum at a temperature slightly below the Néel temperature, and then increases to very large values as the temperature decreases toward the temperature of the ferromagnetic-antiferromagnetic transition. The theoretical polycrystalline susceptibility shows qualitatively the same behavior. The sharp peak in the heat capacity at the temperature of the ferromagnetic-antiferromagnetic transition should become smeared out in the presence of large external magnetic fields. This should happen because the transition temperature for a single crystal depends strongly upon the orientation of the magnetic field relative to the crystal. A similar effect should appear at the Néel temperature, except that there the effect is less pronounced. (auth)

7211 MURA-261

Midwestern Universities Research Assn., Madison, Wis.

A SPECULATION ON A METHOD OF PROPULSION BY ION THRUST. Tihiro Ohkawa. [1957?]. 6p. Contract AT(11-1)-384. $1.80(ph OTS); $1.80(mf OTS).

An amateurish method of obtaining ion thrust by using the drift of a plasma in a magnetic field similar to the adiabatic expansion of gases is discussed. The method is also applicable to ion vacuum pumps. An interesting feature of the engine is that it can be driven directly by thermonuclear reactor. (auth)

7212 UCRL-3712

California. Univ., Berkeley. Radiation Lab.

THE HEAT OF DISSOCIATION OF Bi_2. Elizabeth Brackett and Leo Brewer. Mar. 8, 1957. 5p. Contract W-7405-eng-48. $0.15(OTS).

Widely different values are reported for the heat of dissociation of Bi_2. However, if the data are recalculated by use of the third-law method, the values are found to agree, giving a dissociation energy for Bi_2 of 47 ± 1 kcal. The vapor-pressure data are then re-evaluated to give ΔH_{298} for Bi = 49.5 ± 1 kcal, and ΔH_{298} for Bi_2 = 52.5 ± 2 kcal. (auth)

7213 AEC-tr-2707

ON THE PROBLEM OF OBTAINING HIGH TEMPERATURES AT HIGH PRESSURES. L. (A.) F. Vereshchagin and Ya. A. Kalashnikov. Translated from Zhur. Tekh. Fiz. 25, 1508-17(1955). 9p.

Previous work is reviewed. Measurements of the temperature field in hydrogen, nitrogen, argon, and a mixture of hydrogen and nitrogen were made with the furnace axis vertical and horizontal. The sharp temperature drop with higher pressure inside a furnace is ascribed to the effect of convection rather than increased thermal conductivity of the gas, as was earlier supposed. The electric furnace and high-pressure vessel use are diagrammed. Results are tabulated and graphed. (M.H.R.)

7214 AEC-tr-2735

INVESTIGATION OF THE ELECTRICAL PROPERTIES OF THIN OXIDE FILMS BY THE GASEOUS DISCHARGE PLASMA METHOD. S. S. Gutin. Translated from Zhur. Tekh. Fiz. 20, 1210-12(1950). 4p.

A method was developed for measuring the resistance and capacity of oxide films in Al. Instead of an electrolyte, the plasma of a gas discharge in Hg vapor was used as an electrode. Resultant volt-ampere characteristics in Al_2O_3 are shown. (B.J.H.)

7215 AEC-tr-2916

AUTOMODEL MOTION OF GAS IN A STRONG PERIPHERAL EXPLOSION. (Avtomodel'noe Dvizhenie Gaza Pri Sil'nom Periferičnom Vzryve). G. L. Grodzovskii (Grodzovsky). Translated from Doklady Akad. Nauk S.S.S.R. 111, 969-71(1956). 6p.

The movement of a shock wave toward the symmetry center produced by a strong peripheral explosion is investigated. (D.E.B.)

7216 AEC-tr-2917

RADIATION TRANSFER IN AN INHOMOGENEOUS MEDIUM. (Perenos Izlucheniia v Neodnorodnoy Srede). V. V. Sobolev. Translated from Doklady Akad. Nauk S.S.S.R. 111, 1000-3(1956). 10p.

Equations are developed for determining the luminosity of a semi-infinite medium, consisting of plane-parallel strata, in the presence of a spherical indicatrix of diffusion. (D.E.B.)

7217

ELECTRICAL PROPERTIES OF ARC-EVAPORATED CARBON FILMS. M. D. Blue and G. C. Danielson (Iowa State Coll., Ames). J. Appl. Phys. 28, 583-6(1957) May.

Uniform thin films of carbon in the thickness range 100 to 2300 A have been prepared by arc-evaporation in vacuum. Evaporation rates were about 50 A/sec. The electrical properties of these films suggest that unannealed arc-evaporated carbon had less long-range order and was, therefore, more truly amorphous in structure than any other form of carbon yet obtained. After the films had been heated to 1200°K, however, their properties were similiar to ordinary fine-particle carbon blacks, apparently as a result of increased ordering. The electrical resistivity of unannealed films followed Ohm's law, was not photosensitive, and could be well represented in the temperature range 77 to 300°K by the equation $R = AT^{-b}$, where b = 5. When the carbon films were heated above room temperature, the resistivity and the exponent b were both decreased substantially. After the films had been annealed at 1200°K, the resistivity was reduced by a factor exceeding 800, and could be best represented, in the temperature range 77 to 1200°K, by the equation $R = \alpha - \beta T$. The values of the resistivity, temperature coefficient of resistivity, and thermoelectric power of the annealed films were then more nearly in agreement with the corresponding values for ordinary fine-particle carbon blacks. Other properties and applications of the films are discussed. (auth)

7218

THERMOLUMINESCENCE STUDIES OF ALUMINUM OXIDE. James K. Rieke and Farrington Daniels (Univ. of Wisconsin, Madison). J. Phys. Chem. 61, 629-33(1957) May.

Gamma-ray induced thermoluminescence of aluminum oxides depends on the extent of hydration and the crystal form produced by different calcining treatments. A peak at 236°C depends on sodium impurity. Surface thermoluminescence can be induced by visible light in partially hydrated alumina. (auth)

7219

THERMOLUMINESCENCE OF SOME INORGANIC CRYSTALS AND GLASSES. James K. Rieke (Univ. of Wisconsin, Madison). J. Phys. Chem. 61, 633-5(1957) May.

Over fifty inorganic compounds and glasses have been examined for γ-ray induced thermoluminescence. Impurities are important and only limited generalizations can be made now. (auth)

7220

THERMOLUMINESCENCE OF SODIUM SULFATE AND LEAD SULFATE, AND MISCELLANEOUS SULFATES, CARBONATES, AND OXIDES. Louise E. Moore (Univ. of Wisconsin, Madison). J. Phys. Chem. 61, 636-9(1957) May.

Radiation-induced thermoluminescence has been studied for several sulfates, carbonates, and oxides. The thermoluminescence of sodium sulfate is affected by the method of dehydration and by the impurities taken up on crystallization. Lead sulfate is not thermoluminescent, but is rendered so by the addition of certain impurity ions. (auth)

7221

THE FLOW PROPERTIES OF PURE ^4He AND OF $^3He-^4He$ MIXTURES AT TEMPERATURES BELOW THE LAMBDA-POINT. D. H. N. Wansink and K. W. Taconis. Physica 23, 273-305(1957) Apr.

The flow of pure He^4 and of He^3-He^4 mixtures at temperatures below the lambda-point through a slit with a width of 0.3 micron as a function of hydrostatic pressure heads up to 7000 cm He and fountain pressure differences up to 2500 cm He has been studied. It is concluded that the flow resistance is proportional to the slit length. Values of the normal fluid viscosity, of the normal fluid fraction and of the lambda-point temperature as a function of the He^3-concentration are given. The volume contraction on mixing the two isotopes is estimated. (auth)

7222

THE CALCULATION OF ATOMIC STRUCTURES. Douglas R. Hartree. New York, John Wiley & Sons, Inc., 1957. 190p.

AEROSOLS

7223 AD-87867

Pennsylvania State Coll., University Park.

A BASIC STUDY OF THE PHYSICS OF AEROSOL FORMATION. Final Technical Report. W. G. Cutler and W. E. Meyer. July 1, 1953. 239p. Contract DA-18-064-CML-1402.

The general problems concerning the theory or theories of aerosol formation are reviewed. Several specific types of atomization processes are treated by methods of dimensional analysis. For a spinning disc atomizer drop-size distribution data are given. Obtaining a drop-size distribution by the settling method is discussed. Statistical tests used to check for reproducibility are given and distribution tables, relative frequency curves and cumulative frequency curves are given for two large samples used to check for reproducibility. A statistical analysis of a cascade impactor sample is also presented. The conformal mapping of a fluid sheet is carried out and various methods of measuring, experimentally, the velocity and thickness of liquid sheets are discussed. Experimental equipment constructed and used in this project is described. Techniques developed for the photography of sprays are summarized. Experimental work to determine resolution and depth of field for specific magnifications and F-numbers is described. Photomicrographs of negatives that illustrate the resolution and depth of field are shown. Sources of spray data in available literature are tabulated. Surface tension and its role in the atomization of jets is discussed and the application of ultrasonics to aerosols is outlined. (auth)

COSMIC RADIATION

7224

A NOTE ON CASCADE THEORY WITH IONIZATION LOSS. Alladi Ramakrishnan and S. K. Srinivasan (Univ. of Madras). Proc. Indian Acad. Sci. 45, 133-8(1957) Feb.

The cascade theory of cosmic ray showers including ionization loss is dealt with on the basis of the new approach suggested in an earlier contribution, and an explicit Mellin transform solution is obtained for the mean number of particles produced in an infinite thickness of matter. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

7225 AEC-tr-2711

THE DIELECTRIC CONSTANT OF BARIUM TITANATE. I. P. Kozlobaev. Translated from Doklady Akad. Nauk S.S.S.R. 104, 387-8(1955). 3p.

7226

ON THE RELATION BETWEEN BOND HYBRIDS AND THE METALLIC STRUCTURES. S. L. Altmann and C. A. Coulson (Mathematical Inst., Oxford) and W. Hume-Rothery (Univ. Museum, Oxford). Proc. Roy. Soc. (London) A240, 145-59(1957) May 21.

The failure of existing theories to account for the type of crystal structure of a given metal is emphasized. It is suggested that, particularly when the number of bonding electrons is high, the metallic bond has greater directional characteristics than are generally assumed, and that these can be related to the symmetries of known hybrid bonds. Hybrids involving both gerade and ungerade orbitals (e.g. sp^3) are not centro-symmetrical, and give rise to electron clouds biased on one side of the atom, which are thus strongly directional and suitable for strong bonding. Hybrids derived from gerade orbitals are centro-symmetrical, so that the binding electron has an equal chance of finding itself on opposite sides of the atom. This bonding is weaker, but the number of ligands is doubled; thus the four tetrahedral directions of the sd^3 hybrid can give bonding to eight neighbours, as with an atom in a body-centred cubic structure. These ideas are applied to the face-centred cubic, body-centred cubic and close-packed hexagonal structures of the transition metals, and it is shown that the hybrids suggested by the crystal structures can be correlated with the known electron characteristics of these metals. An explanation of the difference between the crystal structures of the elements of groups VIIA and VIIIA of the first and those of the later transition series is advanced, and the general tendency for transition elements to be more soluble in the body-centred cubic than in the close-packed hexagonal modification of titanium and zirconium is explained. (auth)

ELECTRICAL DISCHARGE

7227 AERE-T/M-71

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

EQUATIONS OF MOTION FOR AN IONIZED GAS. W. B. Thompson. Oct. 1952. Decl. Feb. 12, 1957. 16p.

The equations of motion for the components of a gas discharge were deduced from Boltzmann's equation. A table which summarized the application of these equations in existing discharge theories is included. (B.J.H.)

7228 AEC-tr-2706

VALVE ACTION IN AN ELECTRONIC PLASMA. A. L. Mikaelyan. Translated from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 7, 23-33(1955). 12p.

The propagation of electromagnetic waves between parallel planes and in a coaxial line, with a layer of electronic plasma acted upon by a steady magnetic field is considered. It is shown that in such systems the propagation constants of the waves depend on the direction of motion; this provides a theoretical solution of the problem of constructing valve systems for TEM waves. (auth)

7229 AEC-tr-2729

THE OSCILLATION PROPERTIES OF AN ELECTRON GAS. A. A. Vlasov. Translated from Zhuf. Eksptl.' i Teoret. Fiz. 8, 291-318(1938). 31p.

A complete discussion is given on the oscillation properties of an electron gas. General topics included in this discussion are basic equations and their simplification, solution of the linearized equations, dispersion of the longitudinal waves, and dispersion of the transverse waves. (B.J.H.)

7230 AEC-tr-2746

CERTAIN CHARACTERISTICS OF THE IONIZATION METHOD OF OBTAINING A VERY HIGH VACUUM. N. D. Morgulis. Translated from Zhur. Tekh. Fiz. 25, 1667-70 (1955). 4p.

Several experiments on the ionization manometer method of obtaining a high vacuum were performed. An attempt was made to determine the relative effectiveness of the active barium getter. A mass-spectrometric method was used to determine the composition of the residual gases in the electron tube and how its individual components are then adsorbed. A variation of the "flash" method was used to estimate just that fraction of the residual gases which through adsorption on the surface can distort the results of the investigation. (M.H.R.)

7231 AEC-tr-2750

SPARKING POTENTIAL AT LOW PRESSURES IN He, Ne, A, Kr, AND Xe. A. N. Dikidzhi and B. N. Klyarfeld. Translated from Zhur. Tekh. Fiz. 25, 1038-44(1955). 7p.

The left-hand portions of the Paschen curves in the inert gases He, Ne, A, Kr, and Xe were investigated up to sparking potentials of 40 to 45 kv. Nickel and graphite were used as cathode and anode materials. Results of measurements on all the gases are shown graphically. Investigation of the Paschen curves shows that with a cold Ni cathode, stable values of the sparking potential are obtained. The sparking potential curves in a homogeneous field for A, Kr, and Xe almost coincide, while Ne and He have considerably higher potentials. It was also found that the sparking potential is greater with a graphite cathode than with a Ni cathode and that replacement of the Ni by graphite as the anode material results in a higher sparking potential. The effect of various elementary processes on the location of the sharp rise in the sparking potential curves and on the appearance of anomalous curves is discussed. (B.J.H.)

7232 AEC-tr-2753

CHAIN PROCESS FOR CHARGE ACCUMULATION IN THUNDERCLOUDS. V. M. Muchnik. Translated from Doklady Akad. Nauk S.S.S.R. 99, 537-8(1954). 3p.

Equations are developed which approximately represent the process of charge accumulation in thunderclouds. (B.J.H.)

7233

MINIMUM SPARK BREAKDOWN AND GLOW VOLTAGES. W. A. Gambling and F. W. Crawford (Univ. of Liverpool, Eng. and Univ. of British Columbia, Vancouver). Can. J. Phys. 35, 562-9(1957) May.

Measurements of the spark breakdown voltage between carbon electrodes in hydrogen, argon, nitrogen, and air are given for ranges of the product p (mm. Hg) × d (cm.) between 0.1 and 1000 mm. Hg cm. The results show that in each gas Paschen's Law is obeyed for pd > 10 mm. Hg cm. For pd < 10 mm. Hg cm. deviations from Paschen's Law were observed at the longer gap lengths. The minimum spark breakdown voltage, V_{sm}, occurred near pd = 1 mm. Hg cm. The normal cathode-fall voltage, V_{cn}, was also measured, and was found to be less than V_{sm} in hydrogen, argon, and air, and greater than V_{sm} in nitrogen. A theoretical analysis is made which predicts the relationship $V_{cn} = 1.110V_{sm}$ and the reasons why this condition is seldom found in practice are discussed. (auth)

7234

PINCH EFFECT. Louis C. Burkhardt, Robert E. Dunaway, Joseph W. Mather, James A. Phillips, George A. Sawyer, Thomas F. Stratton, Emory J. Stovall, Jr., and James L. Tuck (Los Alamos Scientific Lab., N. Mex.). J. Appl. Phys. 28, 519-21(1957) May.

Some early studies of the pinch effect, made with a view to its application to the problem of developing a thermonuclear reaction are here presented, together with experimental arrangements for producing pinched discharges in toroidal and straight discharge tubes. Dynamical properties of the pinch and its instabilities are demonstrated, and the possibility of stabilizing the latter is mentioned. (auth)

ELECTRONS

7235

PARITY AND THE POLARIZATION OF ELECTRONS FROM Co^{60}. H. Frauenfelder, R. Bobone, E. von Goeler, N. Levine, H. R. Lewis, R. N. Peacock, A. Rossi, and G. De Pasquali (Univ. of Illinois, Urbana). Phys. Rev. 106, 386-7 (1957) Apr. 15.

In order to investigate parity in weak interactions, two electroplated Co^{60} sources, one on Al and the other on silver-plated rubber hydrochloride film, were used. Electrons were deflected in a cylindrical electrostatic field and then impinged on the scattering foil. The left-right asymmetry of electrons was measured with two end-window Geiger counters. The results indicate nonconservation of parity, electron polarization in the direction opposite to their momentum, and no disagreement with the two-component theory in the initial longitudinal polarization values. (M.H.R.)

7236

THE ABSORPTION OF BETA PARTICLES AS A FUNCTION OF ATOMIC NUMBER. S. Abid Husain (Univ., Karachi) and J. L. Putman (Atomic Energy Research Establishment, Harwell, Didcot, Berks). Proc. Phys. Soc. (London) A70, 304-5(1957) Apr.

When the thicknesses of absorbing foils are plotted in terms of (mg cm^{-2})Z/A, the resulting absorption curves were found to depend on $Z^{\frac{1}{2}}$. The work was done with P^{32} and Sr^{90} and $Sr^{90} + Y^{90}$ sources. (M.H.R.)

GASES

7237 CM-880

Wisconsin. Univ., Madison. Naval Research Lab.

HEAT CONDUCTIVITY IN POLYATOMIC, ELECTRONICALLY EXCITED, OR CHEMICALLY REACTING MIXTURES—III. J. O. Hirschfelder. Aug. 15, 1956. 42p. Contract NOrd-15884.

A survey is made of the theoretical problems involved in estimating the heat conductivity in a chemically reacting gas or gas mixture. New developments which have not been previously considered are presented. The larger the value of the entropy change in a chemical reaction, the larger is the maximum value of the specific heat of the reacting mixture and the coefficient of thermal conductivity of the reacting gas mixture; the deviation of the chemical com-

position from the local equilibrium (or thermodynamics of irreversible processes) solution is expressed very simply in terms of the higher temperature derivatives; the large Prandtl numbers of simple gases at very low temperature and polar gases at room temperature is supposed to be due to the distortion of the molecular distribution as the result of rotational-translation interactions. The Prandtl numbers for rough spheres and for rigid spheroids are found to be somewhat larger than would be expected on this account. Although the Prandtl number of different substances is the same value to within a few percent, the Prandtl number for mixtures may be twice as large or one-half as small as the Prandtl number of its components. An Eucken-type expression is derived for the coefficient of thermal conductivity of a polyatomic gas mixture and found to agree with experimental data. This formula involves the coefficients of self and ordinary diffusion for all of the molecular species. (auth)

7238 AEC-tr-2744

BROADENING OF SPECTRAL LINES AND OSCILLATOR STRENGTH OF THE NOBLE GASES. V. S. Fursov, M. N. Oganov, and A. R. Striganov. Translated from Doklady Akad. Nauk S.S.S.R. 101, 453-5(1955). 4p.

A study was made of the width of spectral lines in argon. A Fabry-Perot interferometer was used to measure the line widths, and a diagram of the optical apparatus is included. The widths of 7 spectral lines were measured at pressures of 0.1, 46.7, 107, and 186 mm Hg, and the results are tabulated. The lines at 4510.7 and 4333.5 A were more greatly broadened with increased pressure than the other lines. (B.J.H.)

7239

ACCURATE MEASUREMENT OF GAS SOLUBILITY. M. W. Cook and D. N. Hanson (Univ. of California, Berkeley). Rev. Sci. Instr. 28, 370-4(1957) May.

An apparatus and a technique accurate and reproducible to 0.1%, have been developed for measuring the solubility of gases in liquids. The criteria necessary for measurements of this accuracy have been established and examined individually in order to provide a systematic approach to the design of gas solubility apparatus. (auth)

Refer also to abstract 7227.

INSTRUMENTS

7240 AECU-3474

Sandia Corp., Albuquerque, N. Mex.

HIGH-VOLTAGE POWER SUPPLIES UTILIZING MECHANICAL CHOPPERS. R. W. Durkee. Apr. 17, 1957. 19p. Contract AT(29-1)-789. (TM-88-57-12). $3.30(ph OTS); $2.40(mf OTS).

A general analysis of the high-voltage chopper-type power supply is presented. Equivalent circuits are derived such that efficiency, surge current, and charge time can be calculated with a reasonable degree of accuracy. (auth)

7241 AECU-3475

Sandia Corp., Albuquerque, N. Mex.

ADAPTER ASSEMBLY SYSTEM. N. L. Maguire and R. K. Parry. May 3, 1957. 15p. Contract AT(29-1)-789. (TM-86-57-14). $3.30(ph OTS); $2.40(mf OTS).

The development of an improved adapter assembly system, designed primarily for use with AN multiconductor connectors, is described. The capabilities of the standard assemblies and some special applications of the system are outlined. Originally designed for limited test equipment calibration usage, these versatile units are now used in diversified applications. (auth)

7242 NP-6266

Harvard Univ., Cambridge, Mass. Dunbar Lab.

PROPERTIES OF MATERIALS AT HIGH PRESSURES AND TEMPERATURES. Final Report. Francis Birch and Eugene C. Robertson. Mar. 1957. 54p. Contract N5ori-07644.

The design for a device for studying polymorphism at pressures up to 30,000 kg/cm^2 and temperatures up to 1500°C is given. (T.R.H.)

7243 WT-1187

Edgerton, Germeshausen and Grier, Inc., Boston.

THERMAL RADIATION MEASUREMENT. Oct. 1956. 16p. Project 39.3 [of] OPERATION TEAPOT. $0.15(OTS).

The thermal flux per unit area was measured at a series of specified distances from a nuclear detonation. Results obtained at 5500, 6800, and 10,500 ft follow the inverse-square-law fall-off, within the limits of reasonable experimental error. (C.H.)

7244 AEC-tr-2743

A HIGH FREQUENCY ION SOURCE. V. M. Morozov. Translated from Doklady Akad. Nauk S.S.S.R. 102, 61-4 (1955). 4p.

A design is given of a high-frequency ion source which is distinguished by a low gas flow rate. It consists of a quartz gas discharge tube with a sealed-in quartz collar, an Al cathode, a high-frequency generator, a permanent magnet, and a focusing system. The operation of the source is described at length. (B.J.H.)

7245

ELECTRON BEAM ANALYZER. A. Ashkin (Bell Telephone Labs., Murray Hill, N. J.). J. Appl. Phys. 28, 564-9(1957) May.

A new technique is described for measuring the charge distribution of an electron beam in a magnetic field. The method is especially applicable to the long, thin, high-current beams commonly used in traveling wave tubes and backward wave oscillators. It consists of making the beam trace out its own characteristics by sweeping it across a pinhole in crossed electric and magnetic fields. The data are presented in the form of oscilloscope pictures of the actual charge distribution. Quantitative measurements of the charge distribution are also obtainable. (auth)

7246

SPACE CHARGE EFFECTS IN BEAM-TYPE MAGNETRONS. Roy W. Gould (California Inst. of Tech., Pasadena). J. Appl. Phys. 28, 599-605(1957) May.

A theoretical treatment of space charge effects in beam-type magnetron amplifers and oscillators is given. It is assumed that the beam is relatively thin and that the magnetic field is large. The "cyclotron waves" are not treated. A space charge parameter appears in this theory of magnetron-type traveling-wave interaction in a manner which is analogous to the manner in which QC appears in ordinary traveling-wave interaction. A distinctive feature of the space charge waves in the magnetron case is that one increases along the beam and the other decreases along the beam. A simple physical explanation of this effect is given. This theory is then used to determine the starting conditions of an M-type backward wave oscillator. It is found that when the tube is long in space charge wavelengths there is an appreciable reduction of starting current. When the space charge parameter approaches zero, the solutions found here reduce to the usual two-wave solutions. (auth)

7247

A PHOTOELECTRIC PARTICLE COUNTER FOR USE IN THE SIEVE RANGE. T. Beirne and J. M. Hutcheon (Atomic Energy Research Establishment, Harwell, Berks). J. Sci. Instr. 34, 196-200(1957) May.

A photoelectric particle counter has been designed for

the rapid measurement of the number of particles per gram in sieved fractions of opaque powders. The instrument can also be used for the determination of the size distribution of a powder in the sieve range in terms of numbers of particles. (auth)

7248

RELIABILITY AS A DESIGN PARAMETER. L. A. Kilbey (A.E.R.E., Harwell). Nuclear Eng. 177-81(1957) May.

Information collected over the past seven years regarding the failure of nucleonic instruments based on A.E.R.E. designs are given. Failures have been analyzed by types, instruments, components, and time of occurrence. (M.H.R.)

7249

INSTRUMENTATION OF GAS AND STEAM CIRCUITS. Nuclear Eng. 2, 186-9(1957) May.

The instruments of the gas circuit and heat exchangers of a gas-cooled reactors which perform the three functions of safety, efficient operation and performance checking are discussed. Topics on gas flow, static pressures, and gas analysis and photographs of various instruments are included. (M.H.R.)

7250

INTERVAL COUNTING TIMER FOR PRECISE PHOTOGRAPHIC PROCESSING. Louis E. Owen (Goodyear Atomic Corp., Portsmouth, Ohio). Photo. Sci. and Tech., Series II, 4, No. 1, 3-5(1957).

A timer suitable for precise photographic processing is described. Operation is based upon the counting of pulses produced at fixed intervals by a switch which is actuated from a cam driven by a synchronous motor. Read-outs at selected number of counts provide aural warning of the impending end of the development period, visual indication of the end of the development and short-stop periods, and indication of the end of the fixing period by de-energizing the agitator motor of the developing machine and sounding a buzzer. Switch selection of various developing periods and fixing periods is provided. (auth)

7251

PRECISE AUTOMATIC MANOMETER READER. J. Farquharson and H. A. Kermicle (Oak Ridge Gaseous Diffusion Plant, Tenn.). Rev. Sci. Instr. 28, 324-5(1957) May.

An instrument has been developed to find the level of mercury in a glass tube automatically and indicate on a digital register the height of the mercury column. The first model has a range of 80 cm, a precision of better than ±0.05 mm and a maximum deviation of ±0.11 mm. The range and deviation depend upon the length and linear accuracy of the metric screw. (auth)

ISOTOPES

7252

AN EMANATING SOURCE FOR I^{132}. D. G. Arnott and C. P. Peruma (London Hospital). Intern. J. Appl. Radiation Isotopes 2, 85-6(1957) Apr.

7253

CONVERSION MEASUREMENT FOR THE DETERMINATION OF THE MOBILITY OF Li^6, Li^7, AND Pb IN MOLTEN LiCl–$PbCl_2$ MIXTURES. A. Klemm and E. U. Monse. Z. Naturforsch. 12a, 319-34(1957) Apr. (In German)

ISOTOPE SEPARATION

7254

INFLUENCE OF OXYGEN ON THE ELECTROLYTIC SEPARATION OF HYDROGEN ISOTOPES. J. Brun and K. Andreassen. Kgl. Norske Videnskab. Selskads. Forh. 28, 1-4(1955).

The favorable effect of oxygen on the isotopic separation efficiency is apparently not accompanied by a depolarizing effect on the cathode potential. On the other hand a cathode depolarizing agent, e.g. $K_3Fe(CN)_6$, does not seem to improve the separation efficiency. It has been suggested that the occurrence of the exchange reaction: $HD_{(g)} + H_2O_{(liq)} = HDO_{(liq)} + H_{(g)}$ at the cathode surface may cause some reduction of the separation primarily obtained during electrolysis, since the equilibrium constant of this reaction is only about 3.8 at room temperatures. The favorable effect of oxygen observed in the above experiments may thus be attributed to suppression of this exchange reaction by poisoning of the catalytically active surface. (auth)

MASS SPECTROGRAPHY

7255

THE STORY OF HERMES. F. R. Paulsen. Atomics 8, 178-80(1957) May.

The history of mass spectrography from 1886 to the present is reviewed. Use of the spectrography in preparing isotopes is discussed. The Hermes and its operation are described. (M.H.R.)

7256

A SIMPLE MASS SPECTROSCOPE OF HIGH SENSITIVITY WITH STIGMATIC DIRECTION FOCUSING. E. Schönheit. Z. angew. Phys. 9, 171-80(1957) Apr. (In German)

MATHEMATICS

7257 AECU-3476

Sandia Corp., Albuquerque, N. Mex.

TABLES OF THE NORMAL PROBABILITY INTEGRAL. D. B. Owen and D. T. Monk. Mar. 25, 1957. 58p. Contract AT(29-1)-789. (TM-64-57-51). $0.40(OTS).

A table of the normal probability integral from minus infinity to h for ±h = 0(0.001)4(0.01)7 to eight decimal places is presented. For extreme values of the argument, Mill's ratio and the normal probability integral are given for −h = 50(1)150(5)500 to eight significant figures. (auth)

7258 LA-2106

Los Alamos Scientific Lab., N. Mex.

A TABULATION OF THE RADIAL COULOMB INTEGRALS (m,n,l). M. Goldstein, R. M. Thaler, and L. C. Biedenharn. Oct. 1956. 120p. Contract W-7405-eng-36. $0.60(OTS).

7259 WAPD-TM-46

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

A CODE TO INVERT THE FOURIER COSINE TRANSFORM—FTI-1. Richard R. Goldberg and Heidi G. Kuehn. Mar. 1957. 14p. Contract AT-11-1-GEN-14. $0.20(OTS).

A code is given for the IBM-704 which inverts the Fourier cosine transform $F(x) = \int_0^\infty \phi(t) \cos xt\, dt$. Theory, program, and operating instructions are included. (M.H.R.)

7260 WAPD-TM-52

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

EXTRAPOLATION TECHNIQUES FOR REAL SYMMETRIC MATRICES. Gerald G. Bilodeau. Mar. 1957. 22p. Contract AT-11-1-GEN-14. $0.25(OTS).

7261

PROGRAMME DESIGN FOR THE C.S.I.R.O. MARK I COMPUTER. IV. AUTOMATIC PROGRAMMING BY SIMPLE COMPILER TECHNIQUES. G. W. Hill and T. Pearcey (C.S.I.R.O., Univ. Grounds, Chippendale, N.S.W.). Australian J. Phys. 10, 137-61(1957) Mar.

Techniques are described for using the C.S.I.R.O. Mark I computer to assemble complete programs from greatly reduced input programs by selecting and transferring routines from standard libraries and forming appropriate commands

to interconnect routines and the problem program. The "compiler" process is described for computer-code programs, and for hyper-code program which use interpretive routines to provide elaborate arithmetical operations corresponding to each hyper-code. Examples of compiler routines are given in computer-code command form and as schematic outlines, and the compiler processes are illustrated by simple problem examples. Possible extensions of compiler techniques are considered and processes for using compiler techniques are discussed. Use of compiler techniques reduces considerably the "human error" in programs, training time of programmers, and the time required for preparation, insertion, and checking of problem programs. (auth)

7262

COMPUTERS. ANALOGUE AND DIGITAL. Nuclear Eng. 2, 198-200(1957) May.

The basic principles of both analog and digital computers are outlined and a comparison made of their respective usages and reliability. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

7263 AERE-C/R-2054

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE SELF-ABSORPTION AND WINDOW-ABSORPTION CORRECTION IN THE 2π β-PROPORTIONAL COUNTER FOR CERTAIN FISSION PRODUCTS. PART 2. J. G. Cuninghame, M. L. Sizeland, and H. H. Willis. Feb. 1957. 23p.

7264 ORNL-2158

Oak Ridge National Lab., Tenn.

POCKET ION CHAMBERS FOR BETA RADIATION DOSE. Harry H. Hubbell, Jr., Robert D. Birkhoff, and Raymond M. Johnson. May 23, 1957. 102p. Contract W-7405-eng-26. $0.55(OTS).

A pocket ionization chamber has been developed which in conjunction with a commercial gamma reading pocket chamber can be used to estimate the beta dose received, or if used alone, to measure the combined beta-gamma dose. The problem was to obtain a simple, rugged chamber which would have a wall sufficiently thin to pass the lower energy beta rays and which would give either no response for gamma rays or one of the same magnitude as the gamma reading pocket meter. Of the six dosimeters constructed and tested, the perforated aluminum walled chamber gave the best beta response. Its response over the range of average energies from about 52 kev to 694 kev varied from about 50% to about 80% of the dose received by the germinal layer of the skin. The response of this chamber to low energy gamma radiation (up to 700 kev) approximates that of the commercial Victoreen pocket chamber. All beta rays of energies less than that which will reach the basal layer of the epidermis were excluded by the 7 mg/cm^2 wall surrounding the sensitive volume. A new method is described for calibrating a pencil for a degraded spectrum of radiation, such as is commonly found in the field. The dosimeter is inserted into the center of an infinite homogeneous aqueous solution of a radioisotope whose beta ray spectrum is known. The dose rate measured by the various pencils is expressed as a percentage of the response of a 7 mg/cm^2 paper walled laboratory standard chamber; an effectively zero thickness wall Mylar ion chamber; or the dose rate as calculated from the Bragg-Gray principle and the specific activity of the solution. The calculations of the flux of electrons in water solution for the beta emitters S^{35}, Ca^{45}, W^{185}, Tl^{204}, Ag^{111}, P^{32}, and Y^{90} are included. (auth)

7265 WAPD-PM-35

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

A BF_3 FILLED IONIZATION CHAMBER FOR POWER REACTOR CONTROL. J. C. Connor. Dec. 1955. 11p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

A BF_3 filled, uncompensated, ionization chamber for power reactor neutron monitoring is described. The chamber was designed to replace the present more costly and complex compensated ionization chamber in the power range of a reactor. For a BF_3 filling pressure of 250 mm Hg, the neutron sensitivity is identical to the Mark I STR compensated chamber (4×10^{-14} amps/nv). A potential of 800 volts is required to assure saturation in a thermal neutron flux of 1.5×10^{10}/cm^2-sec. (auth)

7266

SEWING-NEEDLE PROPORTIONAL COUNTER. A. H. Benade and R. E. Chrien (Case Inst. of Tech., Cleveland, Ohio). Am. J. Phys. 25, 313-17(1957) May.

A simple proportional counter made from common materials, and supplied with high voltage by a circuit made from automotive ignition parts, is described and investigated. Alpha particles from Po^{210} are shown to give up to 25-volt pulses, while beta rays from Cs^{137} produce signals with amplitudes up to 2 volts without the use of any external amplification. These pulses are readily heard with headphones, or amplified by standard public-address equipment. (auth)

7267

REACTOR MONITORING. Atomics 8, 181-3(1957) May.

A tracerlab monitoring service for nuclear reactor use is outlined, with emphasis on monitoring of air, water, and gaseous and liquid effluents. (M.H.R.)

7268

THE USE OF NaI-Tl CRYSTAL SPECTROMETERS IN THE STUDY OF GAMMA-RAY ACTIVITY IN VIVO: A SUMMARY OF DEVELOPMENTS AT THE ARGONNE NATIONAL LABORATORY. L. D. Marinelli (Argonne National Lab., Lemont, Ill.). Brit. J. Radiol. Suppl. 7, 38-43(1956) Nov.

Application of NaI-Tl scintillation counters in the measurement of γ-ray activity emitted by living persons has proved satisfactory in a large variety of circumstances by virtue of its relatively low cost and its versatility. Procedures are described. (C.H.)

7269

AN EXPERIMENTAL EXAMINATION OF THEORIES OF CAVITY IONIZATION. J. R. Greening (St. George's Hospital, London). Brit. J. Radiol. 30, 254-62(1957) May.

7270

HIGH-DISPERSION TWO-DIRECTIONAL-FOCUSING β-SPECTROMETERS. G. E. Lee-Whiting (Atomic Energy of Canada Ltd., Chalk River). Can. J. Phys. 35, 570-5 (1957) May.

Momentum spectra of charged particles are often analyzed with the aid of magnetic focusing; in one type of spectrometer the particles move along a circular arc roughly perpendicular to the lines of force. It is shown that when the beam is turned through an angle of $\pi(n^2 + 1)^{\frac{1}{2}}$ radians in a suitably shaped magnetic field a two-directional focus is obtained. For this type of instrument the dispersion increases rapidly as n is increased, while the aberrations remain roughly constant. Even for values of n in the range 3 to 7 an enormous gain in "luminosity" and a useful increase in the permitted source width should be obtained. Although practical difficulties are introduced by the use of paths of more than one complete revolution, these should not be insuperable if the size of the apparatus is large enough relative to the size of the source, especially if an odd value of n is used. (auth)

7271

PRACTICAL ASPECTS OF INTERNAL-SAMPLE LIQUID-SCINTILLATION COUNTING. Jack D. Davidson and Philip Feigelson (Columbia Univ. and Francis Delafield Hospital, New York). Intern. J. Appl. Radiation Isotopes 2, 1-18 (1957) Apr.

7272

ASSAY OF ELECTRON-CAPTURE NUCLIDES WITH A PROPORTIONAL COUNTER SPECTROMETER. W. S. Lyon and S. A. Reynolds (Oak Ridge National Lab., Tenn.). Intern. J. Appl. Radiation Isotopes 2, 80-4(1957) Apr.

7273

DETERMINATION OF CONCENTRATIONS BY β BACK-SCATTERING. Louis Danguy. Intern. J. Appl. Radiation Isotopes 2, 90(1957) Apr. (In French)

7274

ON A STATISTICAL PROBLEM IN EMULSION MICROSCOPY. H. Olsen, H. Wergeland, and H. Overas. Kgl. Norske Videnskab. Selskabs, Forh. 28, 25-9(1955).

A solution is offered to the problem of the probability of finding an ordinate to a point x on a chord drawn to an arbitrary arc of an ionization track in an emulsion. (T.R.H.)

7275

RADIATION DETECTORS. A SURVEY. J. Sharpe (E.M.I. Electronics Ltd.). Nuclear Eng. 2, 190-7(1957) May.

The various radiation detectors are surveyed. Those included are ionization chambers; conduction, proportional, Geiger, spark, and scintillation counters; and secondary emission, thermal, and passive detectors. Time characteristics, specific applications, diagrams, and data are given. (M.H.R.)

7276

PREPARATION OF HIGH-SENSITIVITY CADMIUM SULFIDE CELLS FOR GAMMA-RAY DETECTION. Lewis E. Hollander, Jr. (Victoreen Instrument Co., Cleveland, Ohio). Rev. Sci. Instr. 28, 322-3(1957) May.

Single synthetic CdS crystals $3 \times 4 \times 10$ mm, having dark conductivities from 10^{-9} to 10^{-10} ohm^{-1} cm^{-1}, were prepared for gamma-ray detection. In a 50 r/hr Co^{60} field the conductivity increased to 10^{-6} ohm^{-1} cm^{-1}. The crystals were grown in a static system at 930 ± 5°C. Indium electrodes were applied by an ultrasonic soldering technique. The effect of constant excitation from radium to reduce the crystal rise time is illustrated. The time response and spectrographic analysis of crystals and commercial CdS powders is presented. (auth)

7277

GEL DOSIMETER FOR DEPTH-DOSE MEASUREMENTS. Howard L. Andrews, Raymond E. Murphy, and Edward J. LeBrun (U. S. Department of Health, Education, and Welfare, Bethesda, Md.). Rev. Sci. Instr. 28, 329-32(1957) May.

A chloral hydrate-agar gel has been used for depth-dose measurements with x rays and electrons. HCl is formed from the chloral hydrate by the radiation and thus changes pH and electrical conductivity of the gel. Radiation beams can be visualized by adding an acid-base indicator. Quantitative measurements are made by spectrophotometry or by probing the gel with a pH electrode or a conductivity electrode pair. Spatial resolution of perhaps 0.2 mm has been obtained with conductivity electrodes. Doses of 2000 rad or more are required to obtain satisfactory records, the lower limit being set by inhomogeneities in the unexposed gel. (auth)

7278

MOVING-PLATE CAMERA FOR NUCLEAR RESEARCH. W. K. Dawson and B. W. Sargent (Queen's Univ., Kingston, Ontario, Can.). Rev. Sci. Instr. 28, 337-41(1957) May.

A moving-plate camera, suitable for investigating the angular and energy distributions of photoprotons, is described. Two nuclear plates, 1 × 3 in., are accurately held with the emulsion surfaces vertical, parallel and facing each other on a carriage, which moves forwards and backwards at constant speed below the target and parallel to the x-ray beam in an evacuated tube. Targets are thin metal foils, 1.5 × 1 in. The angles and energies of tracks recorded in each plate coated with 200-micron emulsion are 20 to 160 degrees and approximately 2 to 16 Mev. The theory of the camera is developed in detail. (auth)

7279

X-RAY POWDER DIFFRACTION ASSEMBLY FOR STUDIES AT ELEVATED TEMPERATURES AND HIGH GAS PRESSURES. Edward J. Goon, John T. Mason, and Thomas R. P. Gibb, Jr. (Tufts Univ., Medford, Mass.). Rev. Sci. Instr. 28, 342-4(1957) May.

A high temperature-high pressure assembly has been designed to be used with a Straumanis-type powder camera and a modified oscillatory attachment. The assembly consists of a small resistance furnace with a cooling shield and a specimen holder. The furnace is capable of heating the sample to a maximum temperature of 500°C and the temperature of the sample can be controlled to within ±1°C. The specimen holder, which is constructed from beryllium and Monel metal, has withstood hydrogen gas pressures above 600 psi at 500°C. The apparatus has been applied to the structural study of the system: uranium-uranium hydride-hydrogen gas. The lattice parameter of uranium hydride (β-tungsten structure) is reported for the temperature range, 25°C to 500°C, with an accuracy of ± 0.001 A. (auth)

7280

TECHNIQUES AND EQUIPMENT UTILIZED IN LOW-TEMPERATURE REACTOR IRRADIATIONS. R. R. Coltman, T. H. Blewitt, and T. S. Noggle (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 28, 375-80(1957) May.

A cryostat used in hole No. 12 of the graphite reactor at Oak Ridge National Laboratory is described in detail. The cryostat which is made almost entirely of aluminum is supplied with cold helium gas from an Arthur D. Little helium refrigerator. Bombardments have been made in the cryostat at temperatures as low as 15°K for periods as long as two weeks. A discussion of the equilibrium temperature attained by a specimen in the cryostat is given taking into account the reactor gamma ray heating effects. A method for measuring stored energy and specific heats of materials bombarded in the cryostat utilizing gamma ray heating is described. A method for pulse annealing specimens at low temperatures employing the discharge of the energy stored in a bank of condensers is also described. Relatively sharp and quite reproducible thermal pulses can be obtained with this method (which is also suitable for use in the laboratory). The hazard of cryogenic devices in high radiation fields is discussed. It is believed that when air is allowed to condense on a cold surface in the presence of intense ionizing radiations, a hazardous condition results. (auth)

7281

SUSPENSION COUNTING OF CARBON-14 IN SCINTILLATING GELS. B. Lionel Funt and Arlene Hetherington (Univ. of Manitoba, Winnipeg). Science 125, 986-7(1957) May 17.

MESONS

7282

μ-MESONIC ATOMS. L. N. Cooper (Inst. for Advanced Study, Princeton, N. J.). Nuovo cimento (10) 4, Suppl. No. 3, 1271-7(1956).

Information on meson spin and magnetic moment, meson mass, nuclear polarization and vacuum polarization gained from a study of mesonic atoms is reviewed. (M.H.R.)

7283

MESON-NUCLEON SCATTERING IN LOW ENERGY REGION. Daisuke Itô and Shigeo Minami (Tokyo Univ. of Education and Osaka City Univ.). Progr. Theoret. Phys. (Japan 16, 548-54(1956) Dec.

The scattering length a for the s-wave of the process $\pi^+ + p \rightarrow \pi^+ + p$ is calculated by tracing the experimental data for α_3. Comparing the value of $4\pi a^2$ with the theoretical value of cross section in the Thomson limit, it is found that the coupling constant $f^2/4\pi$ is nearly equal to 1. Because of the importance of meson-meson interaction inferred from the analysis of meson reaction at 1.5 Bev, the scattering cross sections by this interaction are estimated and are compared with those by the usual meson-nucleon interaction. When the $(\lambda/16)\ (\phi_\alpha\ \phi_\alpha)^2$ -interaction is adopted as a simple model, the effect of this interaction is very small in the case of the value of $(\lambda/4\pi)^2 \cong 1.5$ which has been adopted to explain the π-2π process at 1.5 Bev. (auth)

7284

THE COMPOSITE MODEL FOR NEW UNSTABLE PARTICLES. II. Sho Tanaka (Rikkyo Univ., Tokyo). Progr. Theoret. Phys. (Japan) 16, 631-40(1956) Dec.

The composite particles, which are composed of fundamental particles by strong Fermi-interactions, are assumed to disintegrate through the several universal weak Fermi-couplings. An examination is made from the standpoint of the universal weak Fermi-couplings of whether the conditions required for the internal wave functions of composite π and K mesons from the experimental results, i.e., observed lifetimes or masses of new particles, are mutually consistent. (auth)

NEUTRONS

7285 LA-2099

Los Alamos Scientific Lab., N. Mex.

PREDICTIONS OF FAST NEUTRON SCATTERING DATA WITH A DIFFUSE SURFACE POTENTIAL WELL. J. R. Beyster, R. G. Schrandt, M. Walt, and E. W. Salmi. Dec. 1956. 165p. Contract W-7405-eng-36. $1.00(OTS).

In this report the experimental data on the scattering of fast neutrons for 26 elements are analyzed to obtain parameters for a complex potential well representation of the nucleus. The neutron energy range from 0 to 18 Mev is considered. The four adjustable parameters of this nuclear model are compared with those obtained from other theoretical considerations and analyses. Interpolated and extrapolated parameters were used in calculations of fast neutron scattering cross sections for 23 elements in energy and atomic weight regions where no experimental data exist. (auth)

7286 ORNL-2277

Oak Ridge National Lab., Tenn.

A MONTE CARLO CALCULATION OF AIR-SCATTERED NEUTRONS. C. D. Zerby. May 24, 1957. 127p. Contract W-7405-eng-26. $0.65(OTS).

A description is given of a Monte Carlo calculation to determine the angular distribution and energy spectrum of air-scattered neutrons. The calculation was programmed for computation on the ORACLE. The particular form of Monte Carlo calculation used involved the integration of the Boltzmann equation and is described in some detail. The problem was idealized to have the source in an infinite body of air and used isotropic scattering in the center-of-mass system. The results for the total neutron flux and tissue dose rate at a source-detector separation distance of 64 ft are presented. The source in this case was a point which emitted a line beam of monoenergetic neutrons. (auth)

7287

SPHERICAL-HARMONICS METHOD FOR NEUTRON-TRANSPORT PROBLEMS IN CYLINDRICAL GEOMETRY. B. Davison (Univ. of Toronto, Ontario, Can.). Can. J. Phys. 35, 576-93(1957) May.

The paper deals with the application of the spherical-harmonics method to systems with complete cylindrical symmetry, that is, to systems invariant under rotation around and translation parallel to an axis. Closed-form expressions are given in an arbitrary order of approximation both for the spherical-harmonics moments in terms of the constants of integration and, conversely, for the constants of integration in terms of the spherical-harmonics moments. This removes the need for numerical inversion of matrices and simplifies the treatment of multilayer problems. (auth)

7288

DIFFERENT METHODS OF MEASURING THE MEAN FREE TRANSPORT PATH OF THERMAL NEUTRONS. J. Horowitz. Nuovo cimento (10) 4, Suppl. No. 3, 1335-41 (1956). (In French)

7289

AN ESTIMATE OF THE IMAGINARY PART OF THE COMPLEX POTENTIAL OF NEUTRON SCATTERING. A. Van der Vegt and C. C. Jonker. Physica 23, 359-60(1957) Apr.

The imaginary part of the complex potential of neutron scattering has been recalculated and the results compared with previous work. (M.H.R.)

7290

ON THE DETERMINATION OF THE SLOWING DOWN LENGTH IN ORDINARY WATER USING A PULSED NEUTRON SOURCE. R. Ramanna and M. P. Navalkar (Atomic Energy Establishment, Bombay). Proc. Indian Acad. Sci. 45, 74-83(1957) Feb.

A method of determining the slowing-down age in ordinary water from a fast neutron source to thermal energy, using a pulsed neutron source, is described. The fast neutrons were produced from the D–Be reaction using a cascade generator. Calculations were made on both age and two-group theories, and experiment showed that the two-group theory applies better in the case of water. It was also concluded that the experimental value obtained for age by this method is consistent with the value expected for the D–Be neutrons. (M.H.R.)

NUCLEAR PHYSICS

7291 ANL-5679

Argonne National Lab., Lemont, Ill.

RADIOLOGICAL PHYSICS DIVISION SEMIANNUAL REPORT [FOR] JULY THROUGH DECEMBER 1956. Feb. 1957. 106p. Contract W-31-109-eng-38. $0.55(OTS).

Data are presented from the following studies: the radiation chemistry of xylene; fabrication of a teflon container for scintillating solutions; factors affecting the concentration of Rn in the atmosphere; a comparison of experimental results with theoretical computations of γ radiation in vivo and activity of excreta on a human accidentally contaminated with $Th^{227}Cl_4$ through a puncture wound; operation of a human spectrometer; in vivo measurements of the body burden of Sr^{85}, Te^{129}, and Ra^{226} in human subjects; the development of photomultiplier tubes; the preparation and performance of positive ion sources;

tracer studies on the bone deposition of Ce and Tm in dogs; development of procedures for the study of β particle activity employing thick bone section autoradiograms; the preparation and physical properties of Ba^{133}; studies on background counting rate; the drift velocity of electrons in gases; the development of a multiple exposure photographic technique for studying atmospheric diffusion; and an investigation of automatic data processing methods for use with continuously operating meteorological equipment. A list of publications and a summary of staff activities during the period are included. (For preceding period see ANL-5596.) (C.H.)

7292 CU-153

Columbia Univ., New York. Nuclear Physics Labs. PROGRESS REPORT FOR APRIL, MAY, JUNE 1956 TO THE UNITED STATES ATOMIC ENERGY COMMISSION. Dept. of Physics. 50p. Contract AT-30-1-GEN-72. $7.80(ph OTS); $3.30(mf OTS).

Results of measurements of neutron resonance widths for Ag and Ta are summarized. The analysis of low-energy neutron resonances is discussed, as is the analysis of Nevis neutron velocity selector data. Transmission data on a new sample of liquid Bi were analyzed and give 4.80 ± 0.23 kev for the neutron-electron interactions. Cyclotron and Van de Graaff operations are summarized. The excited states in O^{16} resulting from proton bombardment of N^{15} were studied. Further tests of the resolution and efficiency of the three crystal pair spectrometer were made. Results are tabulated. Studies were also made of the γ rays from the reactions $F^{19}(p,\alpha\gamma)\,O^{16}$ and $N^{15}(d,n\gamma)O^{16}$. A fast non-blocking linear amplifier circuit with a rise time of 0.03 μ sec was developed. Complete circuit diagrams are included, and the operation of the amplifier is described. Development work was continued on the circuitry for the 2000 channel analyzer. Investigations of the shape of the β spectrum of He^6 were completed. Resultant spectra are shown. Improvements on the ultraviolet spectrometer are briefly described. Final measurements on the Zeeman effect of orthopositronium were made, and the value of the fine structure separation between the triplet and singlet states of positronium was found to be $(2.0333 \pm 0.0002) \times 10^5$ mc/sec. Further investigations were made of the decay scheme of A^{35}. Data are also included on the beta decay of Ca^{39} and O^{15}. (For preceding period see Cu-149.) (B.J.H.)

7293 OSR-TN-57-131

Purdue Univ., Lafayette, Ind.
ISOTOPIC SPIN SELECTION RULE $|\Delta I| = 1/2$ FOR THE DECAYS OF STRANGE PARTICLES. Masaaki Kawaguchi. Mar. 15, 1957. 18p. Contract AF18(600)-1579. (AD-120487).

Decay processes of strange particles are re-examined under the assumption of the selection rule $|\Delta I| = 1/2$, when all particles concerned have isotopic spins, but parity is not necessarily conserved. Some of the results obtained before still hold as they are, even if parity non-conservation is taken into consideration. However, the relation between the branching ratio $(\Sigma^+ \to p + \pi^0)/(\Sigma^+ \to n + \pi^+)$ and the ratio of lifetimes $\tau(\Sigma^-)/\tau(\Sigma^+)$ is changed by parity non-conservation. The experimental results on Σ particles may be interpreted as indicating comparable magnitudes for parity conserving and parity non-conserving terms. Some results based on $|\Delta I| = 1/2$ and 3/2 are also discussed for these particles. (auth)

7294 AEC-tr-2717

FINITE-VOLUME EFFECT IN THE ISOTOPE SHIFT IN HYDROGEN AND DEUTERIUM. D. D. Ivanenko and N. N. Kolesnikov. Translated from Doklady Akad. Nauk S.S.S.R. 91, 47-50(1953). 6p.

7295 AEC-tr-2722

MEASUREMENT OF THE COMPENSATION TIME OF SPACE CHARGE IN A BEAM OF POSITIVE IONS. V. S. Anastasevich. Translated from Uspekhi Fiz. Nauk 14, 495-6(1954). 3p.

An expression is given for the compensation time of space charge in a positive ion beam, and an experimental method for measuring this time is briefly described. Experimental values of the time vary from 10 to 200 μsec, which agree with theoretical results. (B.J.H.)

7296

NUCLEAR RADIATION WIDTHS. A. G. W. Cameron (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 666-71(1957) May.

The total radiation widths of nuclear energy levels have been computed using the new level spacing formula of T. D. Newton. The only adjustable constant in this calculation is a normalizing factor, which was determined by comparison with observed radiation widths. The logarithmic average deviation of the observed radiation widths from the calculated values is then equal to a factor 1.37. Radiation widths computed for a series of nuclei close to the valley of beta stability at excitation energies corresponding to the energy release in neutron capture are presented. It is found that in heavy nuclei with large level spacings the radiation widths of electric dipole transitions to the ground state can exceed that computed from the above considerations. This accounts for the unusual nature of the radiative transitions in lead. (auth)

7297

PROBLEMS OF NUCLEAR STRUCTURE. A. Bohr. Nuovo cimento (10) 4, Suppl. No. 3, 1091-1120(1956).

Lecture notes, concerned mainly with low-energy nuclear spectra, are given. The two limiting approaches used in theoretical studies of nuclear structure are combined in a unified model, in which the nuclear dynamics is described in terms of a superposition of independent particles and collective types of motion. Topics covered are: the shell model, rotational states in nuclei, transitional probabilities for deformed nuclei, transitions between states of a rotational band, transitions between different rotational bands, fine structure in alpha decay, alpha decay in even-even nuceli, intensities of fine structure components, effects of the admixture of odd multipoles in the deformation, alpha decay in odd-even nuclei, single-particle motion in ellipsoidal nuclei, nuclear moments of inertia, decoupling of nucleonic motion from collective rotation, effects of the competition between independent particle motion and interactions and various types of nuclear fission. (M.H.R.)

7298

THE NUCLEAR RADIUS. L. N. Cooper (Inst. for Advanced Study, Princeton, N. J.). Nuovo cimento (10) 4, Suppl. No. 3, 1125-36(1956).

The uses of the term "nuclear radius" and the experiments which yield information on its value are reviewed. Among these experiments are ones on electric charge distribution measurements such as: electron scattering, the μ-mesonic atom, the isotope shift, mirror nuclei, and fine structure splitting in heavy elements. (M.H.R.)

7299

MAGNETIC MOMENTS OF NUCLEI. A. de Shalit (Weizmann Inst. of Science, Rehovoth). Nuovo cimento (10) 4, Suppl. No. 3, 1195-1200(1956).

Some of the empirical regularities found among magnetic moments are summarized. The extent to which they can be explained by more or less general arguments is discussed. (M.H.R.)

7300
NEW ATOMS. POSITRONIUM AND MESONIC ATOMS. S. DeBenedetti (Carnegie Inst. of Tech., Pittsburgh). Nuovo cimento (10) 4, Suppl. No. 3, 1209-70(1956).

The studies on positronium and mesonic atoms and the techniques used for their experimental investigation are reviewed. Many phases of the annihilation process, the free atom of positronium, behavior of positrons in condensed materials, μ-mesonic and π-mesonic atoms are discussed. The importance of the progress in instrumentation of scintillation detectors for fast coincidences, fast coincidence circuits, scintillation spectrometry, and pulse-height selecting circuits is emphasized. (M.H.R.)

7301
NON-LOCAL MODELS OF PION-NUCLEON, PION-HYPERON INTERACTIONS. P. Budini and L. Fonda. Nuovo cimento (10) 5, 666-83(1957) Mar.

Starting from the hypothesis that the pion interacts with nucleons and hyperons only through intermediate fields, non-local covariant models of pion-nucleon, and pion-hyperon interactions can be obtained after formal elimination of the intermediate fields. First a simple mathematical model is discussed which admits exact solutions. This model has some formal features in common with the Pais-Uhlenbeck non-local theory but avoids the non definite energy difficulty. From this model a static nucleon-nucleon potential is obtained which exhibits a core effect in the central part and no divergence in the tensor part. Then a physical model is suggested in which the internal field is represented by a couple of K mesons of opposite parity. A linear approximation of this model is equivalent to a non-local form factor theory of pion-nucleon pion-hyperon interactions of the Kristensen-Møller type in which the Fourier transform of the form factor is, however, of a class more general than that of the algebraic functions. A theory started from this form factor Lagrangian exhibits general convergence features which are briefly discussed in an appendix. In this linear approximation, relations between the K-nucleon-hyperon and pion-nucleon, pion-hyperon coupling constants, are obtained. (auth)

7302
FURTHER RESULTS ON PARITY CONSERVATION IN π-μ-e DECAYS. C. Castagnoli, C. Franzinetti, and A. Manfredini. Nuovo cimento (10) 5, 684-8(1957) Mar.

In a previous note the present authors gave some preliminary results on the angular distribution of the decay products in π-μ-e decays. This research was suggested by Lee and Yang to verify parity conservation in weak interactions. In fact, if parity conservation is violated in both processes (π-μ and μ-e decays) the angular distribution of the electron with respect to the line of motion of the μ meson in the system in which the π is at rest, is expected to follow the law $f(\omega) = \text{const} \times (1 + \alpha \cos \omega)$. On a total of 1028 events $\alpha = -0.222 \pm 0.067$ was obtained. The probability of α being zero (isotropic distribution) is found to be $\sim 3 \times 10^{-3}$. All the decays have been observed in plates exposed to cosmic rays. (auth)

7303
PARITY CONSERVATION AND THE MASS OF THE NEUTRINO. B. F. Touschek. Nuovo cimento (10) 5, 754-5(1957) Mar.

The transformation conditions of the Lagrangian in which neutrinos can be singly produced or annihilated are briefly discussed. (B.J.H.)

7304
TWO-NUCLEON PROBLEM WITH PION THEORETICAL POTENTIAL. IV. PHOTODISINTEGRATION OF DEUTERON AT 20 Mev. Junji Iwadare and Shoichiro Otsuki (Kyoto Univ.), Mitsuo Sano (Univ. of Tokyo), Shuji Takagi (Osaka Univ.), and Wataro Watari (Hiroshima Univ.). Progr. Theoret. Phys. (Japan) 16, 658-66(1956) Dec.

The photodisintegration of the deuteron at about 20 Mev, assuming the pion theoretical potential to make a check for the validity of the potential, is discussed. A detailed calculation shows that the pion theoretical potential gives a qualitative agreement with experiments, especially in predicting a large isotropic part in the angular distribution of the final nucleons. This agreement is mainly attributed to the strong tensor force in the triplet P states and the possible hard-core-like repulsion in the singlet S state which was found in the previous analyses phenomenologically. It is to be noted, however, that there remain some ambiguities concerning the effects of the interaction moment at small inter-nucleon distances. (auth)

7305
SHELL MODEL AND CHARACTERISTICS OF SINGLE LIGHT NUCLEI BETWEEN A = 16 AND A = 41. F. Winterberg. Z. Naturforsch. 12a, 271-81(1957) Apr. (In German)

7306
THE THEORY OF SATURATION BY MAGNETIC NUCLEAR RESONANCE. G. Vojta. Z. Naturforsch. 12a, 282-94 (1957) Apr. (In German)

7307
ON THE APPLICABILITY OF SHELL MODELS AS APPROXIMATION FOR SINGLE LIGHT NUCLEI. Rolf Hüper. Z. Naturforsch. 12a, 295-310(1957) Apr. (In German)

7308
TWO-NUCLEON PROBLEM WITH PION THEORETICAL POTENTIAL. III. p-p SCATTERING AT 18.2 Mev. Junji Iwadare, Shoichiro Otsuki, and Ryozo Tamagaki (Kyoto Univ.) and Wataro Watari (Hiroshima Univ.). Progr. Theoret. Phys. (Japan) 16, 604-12(1956) Dec.

A p-p scattering experiment at 18 Mev is analyzed from the point of view of the pion theory. The pion theoretical potential, which is consistent with all low energy phenomena, gives a precise fit to the experimental data at 18 Mev. Especially, it is found that in the triplet odd state an attractive central potential around the pion range is required from the experimental data. This attractive potential is consistent with the two-pion-exchange potential. (auth)

NUCLEAR PROPERTIES

7309 AERE-R/M-100
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
SOME THERMAL PILE NEUTRON ABSORPTION CROSS-SECTIONS MEASURED WITH THE DIMPLE PILE OSCILLATOR. J. D. Cummins and A. H. Spurway. Dec. 1956. 15p.

The measurements of the ratios of the thermal neutron absorption cross sections of Mn, Zr, Ag, In, Sm, Eu, Gd, and Dy to that of the standard Harwell B_2O_3 are described. Assuming a value of 783 barns for the absorption cross section of the Harwell boron, the absorption cross sections of these elements are derived and compared with earlier values. (auth)

7310 D2-1851
Boeing Airplane Co., Seattle.
MACHINE CALCULATIONS OF NEUTRON CROSS-SECTIONS FOR AIR. M. D. Pearson. May 8, 1957. 38p.

Cloudy crystal ball parameters were used to calculate total, scattering, and differential scattering cross-sections for neutrons incident upon air nuclei for energies in the laboratory system from 0.25 to 14.75 Mev in 0.5-Mev intervals, and for 20 different scattering angles in the laboratory system. (auth)

7311 LA-2114

Los Alamos Scientific Lab., N. Mex.

SUMMARY OF NEUTRON-INDUCED FISSION CROSS SECTIONS. R. L. Henkel. Feb. 25, 1957. 12p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

This report supersedes part of LA-1714.

High-energy neutron fission cross sections for U^{233}, U^{235}, U^{238}, and Pu^{239} are graphed. Most of the data are from recent measurements, as yet not published. (M.H.R.)

7312

IRON 60. Jean-Claude Roy and Truman P. Kohman (Carnegie Inst. of Tech., Pittsburgh). Can. J. Phys. 35, 649-55 (1957) May.

The long-lived radionuclide Fe^{60} has been observed through extraction of its disintegration product, 10-minute Co^{60m}, from the iron fraction isolated from a copper target bombarded with ~400-Mev protons. Direct observation was prevented by the Fe^{59} present. Yield considerations indicate the Fe^{60} half life to be $\sim 3 \times 10^5$ years, uncertain by a factor of 3. (auth)

7313

THE DECAY OF Au^{193} AND LEVEL SCHEME OF Pt^{193}. G. T. Ewan (McGill Univ., Montreal, Quebec). Can. J. Phys. 35, 672-92(1957) May.

Au^{193} has been produced as the daughter of Hg^{193} formed by the reaction $Au^{197}(p, 5n)Hg^{193}$ in the McGill synchrocyclotron. The internal conversion spectrum and unconverted γ-ray spectrum have been examined using β-ray spectrometers, NaI spectrometers, and coincidence techniques. Au^{193} decays by electron capture to Pt^{193} with a half life of 17.5 ± 0.2 hr. An upper limit of 0.08% per disintegration has been placed on the probability of emission of positrons in this decay. Twenty-eight γ rays, all below 500 kev, have been observed associated with the decay of Au^{193}. The first excited state of Pt^{193} has been shown to be at 12.7 kev and the lifetime of this state measured as $(2.2 \pm 0.8) \times 10^{-9}$ sec. A level scheme is proposed for Pt^{193}. (auth)

7314

NUCLEAR SPIN-SPIN COUPLING IN HYDROCARBONS. Eiko Aihara (Tokyo Inst. of Tech., Japan). J. Chem. Phys. 26, 1347-8(1957) May.

7315

COULOMB EXCITATION OF HEAVY NUCLEI. J. O. Newton (Atomic Energy Research Establishment, Harwell, Eng.). Nuovo cimento (10) 4, Suppl. No. 3, 1156-61(1956).

The experiments described were done to check some of the theoretical predictions about the properties of the rotational states of odd-A nuclei. Five radioactive nuclei were bombarded with singly charged helium ions having energies up to 3 Mev. An attempt was made to observe all three γ rays associated with the excitation of the first two rotational states of the odd A nuclei. Tables and graphs are included, though the analysis is not yet complete. (M.H.R.)

7316

LOW-LYING 0^+-STATES IN NUCLEI. A. S. Reiner. Physica 23, 338-48(1957) Apr.

Low-lying 0^+ states in even-even nuclei are discussed and correlated with their shell structure. The merits of the hypothesis of pair promotion as a possible explanation for their occurrence are investigated and checked for the Ge^{72} case. If this hypothesis were true, the rate of $0^+ \rightarrow 0^+$ transitions would be a sensitive measure of the residual particle interactions. The conclusion can be drawn that only a fraction of the internucleon potential is active in the transition between the nucleons in the excited and ground states. The investigation of nuclei where 0^+ states might be expected could lead to better founded conclusions. (auth)

7317

ELECTRON EXCITATION OF 3p LEVELS OF O_I. I. C. Percival (Univ. Coll., London). Proc. Phys. Soc. (London) A70, 241-52(1957) Apr.

The collision strengths for low-energy electron excitation of O_I from the ground level to the $2p^3(^4S)3p\ ^3P$ and ^5P excited levels have been calculated using the distorted wave Born–Oppenheimer approximation, and the ^5P collision strength using the exchange-distorted wave Born–Oppenheimer approximation. Difficulty with the orthogonality properties of the radial functions of the 3p orbitals leads to an investigation of the approximate atomic wave functions used in the calculations. A comparison of fine-structure separations suggests that for the ^3P excited level a single-configuration Hartree-Fock wave function with one parent term is insufficiently accurate for the calculation of these collision strengths. A similar comparison leads to an improved estimate of the ^5P collision strength, though various corrections to the estimate might modify it within wide bounds. A method of calculating certain exchange integrals is described. It is concluded that before calculating collision cross sections for similar processes, great care should be taken to ensure that the atomic wave functions are sufficiently accurate. (auth)

7318

THE DESIGN OF "SELFTARGETS" FOR THE NUCLEAR REACTION $D(d,n)He^3$ AND ITS RELATIONSHIP WITH THE PROBLEM OF DIFFUSION OF H IN METALS. Klaus Fiebiger. Z. angew. Phys. 9, 213-23(1957) May. (In German)

7319

ON THE MEASUREMENT OF 18- AND 4.5-Min-Tc AND A NEW SHORT LIVED Tc^{102}. J. Flegenheimer and D. Geithoff. Z. Naturforsch. 12a, 351(1957) Apr. (In German)

NUCLEAR REACTORS

7320 AECU-3349

Little (Arthur D.) Inc., Cambridge, Mass.

GAS PRESSURIZATION OF HOMOGENEOUS REACTOR TEST. Feb. 14, 1956. Includes Appendices A through G, Decl. Aug. 17, 1956. 94p. For Oak Ridge National Lab. Contract [W-7405-eng-26]. $1.00(OTS).

The design and development of the pressurizer for the HRT high-pressure circuits are described. The method selected involved maintenance of over-pressure (to prevent boiling and reduce volume of radiolytic gas) and provision of a cushion by the injection of a gas. This eliminates the need of raising the temperature above 300°C (maximum core temperature), thereby minimizing corrosion problems. The other design considerations are discussed, and calculations and flowsheets are included. (T.R.H.)

7321 AERE-R/R-2151

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

STUDIES ON ZEPHYR WITH A THORIUM ENVELOPE. R. M. Absalom, B. G. Chapman, J. E. R. Holmes, H. Rose, T. B. Ryves, and M. Waldegrave. Jan. 31, 1957. 35p.

An account is given of the measurements made on Zephyr with an inner envelope of natural uranium and an outer main envelope of thorium. The main conclusions reached are that the neutron spectrum is more degraded in a thorium envelope than in a uranium envelope; the breeding ratio of the mixed assembly was 1.8 ± 0.2; and, the breeding ratio of Zephyr with an entirely thorium envelope was estimated at 1.5 ± 0.2. (auth)

7322 APAE-Memo-92

Alco Products, Inc., Schenectady, N. Y.

APPR-1 CONTROL ROD EXPERIMENTS AND CALCULA-

TIONS. F. B. Fairbanks and J. G. Gallagher. Mar. 6, 1957. Decl. May 21, 1957. 35p. Contract AT(11-1)-318. $0.35(OTS).

The methods used to treat partially and fully inserted APPR-1 control rods are described. The fully inserted control rods are treated by methods developed by Dr. R. L. Murray. The worth of the centerline and 5 rod bank show good agreement with experiment. Partially inserted control rods are treated by the window shade model. Good agreement was obtained for partial insertion in clean reactors and poor agreement with poisoned reactors. Calculated flux distribution and relative shim bank worth showed good agreement with experimental results. (auth)

7323 APAE-Memo-96

Alco Products, Inc., Schenectady, N. Y.

APPR-1 HOT CHANNEL FACTORS. RE-EVALUATION ON THE BASIS OF MANUFACTURING EXPERIENCE AND ZERO POWER EXPERIMENTS. J. O. Brondel. May 6, 1957. 23p. Contract AT(11-1)-318. $4.80(ph OTS); $2.70(mf OTS).

On the basis of recent experience with APPR-1 fuel elements manufactured by ORNL, the hot channel factors have been derived from the observed dimensional deviations. On the basis of recent zero power experiments at the critical facility and experience with the flow test rig, both at Alco, the hot channel factors were also derived. The combined hot channel factor, a product of the individual factors, is given. (auth)

7324 BNL-3200

Brookhaven National Lab., Upton, N. Y.

THE KINETICS OF A REACTOR TEMPERATURE FLASH AND ASSOCIATED PROBLEMS. Jack Chernick. Oct. 6, 1950. Decl. Dec. 2, 1955. 18p. $3.30(ph OTS); $2.40 (mf OTS).

Methods are developed for treating the kinetics of a reactor temperature flash. In the case of an approximately adiabatic flash, an overshoot in both power and metal temperature will occur. Formulae are given for estimating the extent of the flux and temperature overshoot and their time of occurrence. The allied problems of the uranium temperature distribution during a flash and the expected thermal stresses are treated for the extreme cases of very long and very short initial reactor periods. In the former case the temperature distribution is essentially that of steady operation and in the latter case the temperatures follow the distribution of heat sources. Thus the thermal gradient is directed outward in a slow flash and is reversed in direction in a fast reactor flash. As long as the metal temperature is below 350°C, no severe thermal stresses occur in the cases considered. (auth)

7325 CF-56-8-208(Del.)

Oak Ridge School of Reactor Technology, Tenn.

600 MW FUSED SALT HOMOGENEOUS REACTOR POWER PLANT. Reactor Design and Feasibility Study. R. W. Davies, D. H. Feener, W. A. Frederick, K. R. Goller, I. Granet, G. R. Schneider, and F. W. Shutko. Aug. 1956. Decl. with deletions Mar. 4, 1957. 249p. $1.25(OTS).

The reactor is a fused salt, homogeneous, intermediate energy reactor that operates at a power density of 55 watts/cc with an enriched U^{235} inventory of 240 kg. The fuel bearing fused fluoride salt functions as neutron moderator and heat transfer medium. It is circulated through the multi-pass reactor vessel and transfers the fission heat to a Na loop within the reactor vessel by an annular, U-tube heat exchanger which surrounds the central core. This heat is then transferred from this radioactive Na loop to an intermediate, non-radioactive Na loop, which is used to generate 1000°F superheated steam at 1800 psig to drive a steam turbine-generator unit. The net thermal plant efficiency is 38.2% at a maximum net electrical output of 229 Mw. (auth)

7326 CRR-644-2

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PROCEEDINGS OF THE TRIPARTITE REACTOR CORE CONFERENCE HELD AT CHALK RIVER, ONTARIO, JANUARY 9-12, 1956. PART II. EXPERIMENTS PLANNED OR IN PROGRESS. J. W. Greenwood and J. E. Woolston, eds. Apr. 1957. 29p.

Brief outlines of research programs at Harwell, Argonne, Savannah River, KAPL, Hanford, Atomics International, ORNL, Chalk River, and Brookhaven on the determination of reactor lattice characteristics are given. (D.E.B.)

7327 IGR-R/R-209

United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.

VARIATIONAL PRINCIPLE OF ONE-GROUP DIFFUSION THEORY FOR ANISOTROPIC AND INHOMOGENEOUS MEDIA. R. T. Ackroyd. Apr. 1957. 8p.

A variational principle is given for one-group theory of diffusion in anisotropic and inhomogeneous reactors. The principle can be used as the basis for a Rayleigh-Ritz approximation procedure for the critical Laplacian and the flux. (auth)

7328 KAPL-1770

Knolls Atomic Power Lab., Schenectady, N. Y.

QUARTERLY REACTOR TECHNOLOGY REPORT NO. 1 [FOR] JANUARY 1—MARCH 31, 1957. 76p. Contract W-31-109-Eng-52. $0.45(OTS).

Developments in hot extrusion techniques for dispersion-type fuel elements are discussed. Results from radiation effects experiments with U—Zr alloys and UO_2—stainless steel systems are reported. Experimental castings of Be were made in an effort to produce a fine-grained equiaxed structure. The effects of SiC, ZrH_2, and Al additives on nucleation and structure are discussed. In-pile loop tests were conducted to determine the characteristics of corrosion product activity buildup in carbon steel cooling systems and to evaluate the efficiency of various resin forms in removing this activity. Activity buildup and removal using intermittent and continuous H^+-, NH_4^+-, and Li^+-form resin demineralizers are plotted. A series of tests on the sliding friction and wear characteristics of stainless steel in high-temperature water is reported. Satisfactory techniques for extruding Eu_2O_3—stainless steel dispersion-type control rods are described. Expressions are developed for describing natural-convection heat transfer in liquid metals. Calculations were performed to determine the extent of epithermal neutron absorption by theoretically pure thermal slabs. Flux distribution studies of spiked lattices are reported. Critical mass as a function of radius was plotted for a number of right-cylinder Fe—H_2O matrices. (D.E.B.)

7329 LA-2112

Los Alamos Scientific Lab., N. Mex.

A MOLTEN PLUTONIUM FUELED REACTOR CONCEPT — LAMPRE. R. M. Kiehn, A. S. Coffinberry, and L. D. P. King. Jan. 1957. 14p. Contract W-7405-eng-36. $0.20(OTS).

A brief discussion is given of the concept known as Los Alamos Molten Plutonium Reactor Experiment (LAMPRE). A preliminary design is given for the purpose of illustration. The detailed design will be the subject of a later report. (auth)

7330 NP-6311

Organization for European Economic Co-operation, Paris.

EXPERIMENTAL REACTORS: PROPOSALS FOR THEIR CO-OPERATIVE DEVELOPMENT IN EUROPE. Mar. 1957. 34p.

Some general remarks are included on the aims and principles of a program for the development of reactors in Europe. Reactor types recommended for development include boiling reactors, liquid-metal fuelled reactors, homogeneous aqueous reactors, test reactors, and fast breeder reactors. The advantages and problems of these reactors are briefly considered. Types not recommended for development are listed with the reasons for their exclusion. The framework for common activities is also discussed. (B.J.H.)

7331 WAPD-TM-29

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

RADIOCHEMISTRY OF THIRD PWR FUEL MATERIAL TEST X-1 LOOP NRX REACTOR. Paul W. Frank, Kenneth H. Vogel, and Paul Cohen. Feb. 1957. 63p. Contract AT-11-1-GEN-14. $0.40(OTS).

The test section contained two UO_2 fuel elements, one of which contained a manufactured defect in the form of a 0.005-in. diam. hole. The release of fission product activity and its distribution in a prototype PWR loop were studied. (T.R.H.)

7332

FIRST LARGE SCALE BREEDER REACTOR. THE U.K.A.E.A'S NEW INSTALLATIONS AT DOUNREAY. Atomics 8, 158-61(1957) May.

The Dounreay reactor is fuelled with uranium and U^{235} or plutonium, has a blanket of depleted uranium, and is cooled by means of a sodium-potassium alloy. With an output of 60 Mw thermal, and 20 Mw electrical energy, this will be world's first large-scale breeder reactor, and will assist Britain's electrical power program. The engineering problems involved in the construction of the sphere which is 135 ft in diameter and the system for the disposal of effluents below the sea bed are dealt with in some detail. (M.H.R.)

7333

HARWELL'S RESEARCH REACTORS. F. W. Fenning. Atomics 8, 162-7, 174(1957) May.

The design, construction, operation, and the contributions to the development of the nuclear power program of the eight research reactors at Harwell are described. Two new reactors under construction are mentioned. (M.H.R.)

7334

CHEMICAL ASPECTS OF NUCLEAR POWER. 2. REACTOR MATERIAL PROBLEMS. F. S. Martin. Atomics 8, 168-73(1957) May.

Chemical aspects of non-metallic reactor components, such as ceramic fuels, moderators and cooling and cladding materials, are considered. Topics discussed are heterogeneous non-metallic fuels, metallic systems, aqueous systems, and aqueous slurries of homogeneous fuels; coolants and moderators; light and heavy water reactions; liquid metal coolants; gaseous coolants; graphite moderator; and reactions of the canning or cladding materials such as aluminum and zirconium. (M.H.R.)

7335

THE TROMBAY REACTOR AND INDIA'S NUCLEAR ENERGY PROGRAMME. E. W. Titterton (Australian National Univ., Canberra). Atomics 8, 174-7(1957) May.

The need for atomic energy in India, the work of the Department of Atomic Energy, the construction, operation, and research facilities of the Trombay reactor, and the processing of fissile materials are discussed. Mention is also made of a Canadian-Indian reactor under construction and the help given the program by various organizations. (M.H.R.)

NUCLEAR TRANSFORMATION

7336

PROTONS EJECTED FROM NICKEL BY 17.5 MeV BREMSSTRAHLUNG. B. M. Spicer, E. G. Muirhead, and G. G. Shute (Univ. of Melbourne). Australian J. Phys. 10, 217-21 (1957) Mar.

The photoprotons from nickel at energies below the peak of the (γ,p) giant resonance have been investigated. A nickel foil of thickness 0.0007 in. was irradiated with 17.5 Mev bremsstrahlung, and the charged particles emitted were detected in two Ilford C2 emulsions (100μ thick). It was concluded that, though statistical theory can account for the energy distribution of all or most of the photoprotons emitted from nickel, the angular distribution shows evidence of peaks. These peaks are not easily explained on either the statistical or direct photoeffect theory. (M.H.R.)

7337

THEORY OF "STRIPPING" REACTIONS. J. Horowitz. Nuovo cimento (10) 4, Suppl. No. 3, 1137-46(1956). (In French)

General theorems are developed for stripping reactions. They are applied to the specific cases of (d,n) and (d,p) reactions. (B.J.H.)

7338

PHOTONUCLEAR REACTIONS WITH EMISSION OF NEUTRONS. C. G. Schuhl. Nuovo cimento (10) 4, Suppl. No. 3, 1162-71(1956). (In French)

Discussions are included on the characteristics of a betatron bremsstrahlung spectrum, methods used in the study of (γ,n) reactions, and experimental results obtained with a betatron. Theoretical interpretations of (γ,n) reactions and discussions of the fine structure of (γ,n) reactions are also included. (B.J.H.)

7339

MAGNETIC ANALYSIS OF TRITONS AND ALPHA PARTICLES EMITTED FROM THE DEUTERON BOMBARDMENT OF TEFLON. F. A. El Bedewi and I. Hussein (Univ. of Alexandria, Egypt). Proc. Phys. Soc. (London) A79, 233-40(1957) Apr.

The energy spectra for particles emitted from the $F^{19}(d,t)F^{18}$ and $C^{12}(d,\alpha)B^{10}$ reactions have been measured by magnetic analysis. The mean energy of the incident deuterons is 8.9 Mev. The energy levels of F^{18} are determined at 0.94 ± 0.02 Mev and 1.07 ± 0.02 Mev. The latter level is found to have T = 1. The energy levels of B^{10} are only observed at 0.72 Mev and 2.14 Mev. The absence of an alpha particle group corresponding to a level at 1.74 Mev, characterized by T = 1, is good evidence for the operation of the isobaric spin selection rule. Angular distributions of these triton and alpha particle groups are presented. The triton distributions are fitted to theoretical pick-up curves. The angular momenta carried away by the picked-up neutron leaving the nucleus F^{18} at the ground, 0.94 Mev and 1.07 Mev states are found to be 0, 1 and 0 respectively. (auth)

7340

FORMATION OF LIGHT NUCLEI IN THE EXPANDING UNIVERSE. Chushiro Hayashi and Minoru Nishida (Kyoto Univ.). Progr. Theoret. Phys. (Japan) 16, 613-24(1956) Dec.

The building up of light nuclei up to Ne^{20} out of initial protons and neutrons in the early stage of the expanding universe is studied, taking account of the α-capture re-

actions. If we take the matter density $\rho_m = 10^6 \sim 10^7$ g/cm^3 at T = 10^{10} °K, we can obtain the relative abundance of hydrogen, helium and oxygen, consistent with present observation. The possibility of forming heavier nuclei is discussed. (auth)

PARTICLE ACCELERATORS

7341 AERE-GP/R-2095
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
NON-LINEAR EFFECTS IN SPIRAL-RIDGE CYCLOTRONS. [PART I]. N. M. King and W. Walkinshaw. Nov. 1956. 21p.

Radial orbit stability in the proposed conversion of the 110-in. Harwell synchrocyclotron is analyzed on the basis of trajectories computed from a non-linear equation of motion. Emphasis is on the effects due to the $2\pi/3$-mode quadratic resonance, whose influence is found to extend to much lower energies than the 245 Mev estimated on linear theory. The effects are interpreted in terms of restriction of stable motion to a small region of displacement-divergence phase space. It is suggested that the difficulties might be overcome by incorporating a small amount of frequency modulation during the final stage of the acceleration. At energies below the resonance region, a further restriction on stable motion may be encountered. This may be explained in terms of a "glancing divergence" σ and amplitude A; when the orbit variables exceed these values, the protons travel along a valley between two ridges, with consequent blow-up. Finally, the way in which these data modify the design proposals is discussed, and further restrictive effects are anticipated. (auth)

7342 LAMS-2102
Los Alamos Scientific Lab., N. Mex.
DESIGN STUDY FOR A 12-BEV CONSTANT-GRADIENT PROTON SYNCHROTRON. H. V. Argo, R. W. Freyman, F. B. Harrison, H. K. Jennings, A. D. McGuire, D. E. Nagle, T. M. Putnam, F. L. Ribe, F. K. Tallmadge, and R. W. Winks. Dec. 5, 1956. 126p. Contract W-7405-eng-36. $0.65(OTS).

A proposal is made to construct a 12-Bev proton accelerator at Los Alamos. A detailed examination of the engineering and physics aspects of the program is presented first. Next the requirements in men and money are studied with a view toward making the maximum use of engineering and construction facilities outside of Los Alamos. The conclusion is reached by the study group that construction of the accelerator is practical and would enable the laboratory to play an important role in the new basic physics. (auth)

7343 MURA-258
Midwestern Universities Research Assn., Madison, Wis.
THE EQUILIBRIUM ORBIT OF A FIXED-FIELD ACCELERATOR. G. Parzen. Apr. 25, 1957. 11p. Contract AT(11-1)-384. $3.30(ph OTS); $2.40(mf OTS).

A method is presented for obtaining an approximate expression for the equilibrium orbit of a fixed field accelerator having an arbitrary magnetic field. Results are given for the general radial sector (Mark I) and the general spiral sector (Mark V) machines. It is believed that the results should be good to 10 or 20% for machines being considered at present. The results of the theory are compared with results obtained numerically. (auth)

7344 MURA-260
Midwestern Universities Research Assn., Madison, Wis.
EXPERIMENTS ON RADIO FREQUENCY KNOCKOUT OF STACKED BEAMS. L. W. Jones, C. H. Pruett, and K. M. Terwilliger. May 1957. 7p. Contract AT(11-1)-384. $1.80(ph OTS); $1.80(mf OTS).

A major problem in the building up of intense circulating currents in an FFAG accelerator is the effect on the stacked beam of the radio frequency voltage accelerating additional particles. When this accelerating frequency is in resonance with the betatron oscillations of the stacked beam, the oscillation amplitude may be driven and the beam destroyed. Experiments have been performed with the radial sector FFAG electron model which demonstrate that the quantitative magnitude of the effect is in agreement with calculations. (auth)

7345 MURA-281
Midwestern Universities Research Assn., Madison, Wis.
QUARTERLY REPORT TO THE ATOMIC ENERGY COMMISSION FOR THE PERIOD FEBRUARY 6, 1956 TO MARCH 31, 1957. May 1, 1957. 47p. $7.80(ph OTS); $3.30(mf OTS).

Abstracts for publications and reports issued since Feb. 1956 are included. General summaries are given on experimental, theoretical, and digital computer work during the period. (B.J.H.)

7346 NYO-7735
Stevens Inst. of Tech., Hoboken, N. J.
THE MEGATRON. David Finkelstein. Apr. 10, 1957. 10p. Contract AT(30-1)-1921. $1.80(ph OTS); $1.80 (mf OTS).

A plasma accelerator of the pulsed air-core betatron type is proposed (megagauss betatron). This is the preliminary design report for a pilot model to operate at 100 Mev. The pilot model is based on a peak field of $\frac{1}{2}$ megagauss. The diameter of the accelerator proper is 5 cm and the associated capacitor bank must store 2×10^5 joule. (auth)

RADIATION ABSORPTION AND SCATTERING

7347 AEC-tr-2712
ELECTRON-LOSS CROSS SECTIONS OF Li AND Na IONS IN THE 80-250 KEV ENERGY RANGE. Kh. L. Leviant, M. I. Korsunskii (Korsunsky), L. I. Pivovar, and I. M. Podgornyi. Translated from Doklady Akad. Nauk S.S.S.R. 103, 403-5(1955). 4p.

The electron-loss cross sections of Li^+ and Na^+ ions passing through air were measured for energies between 80 and 250 kev. The ion sources were $Li_2O \cdot Al_2O_3 \cdot 2SiO_2$ and $Na_2O \cdot Al_2O_3 \cdot 2SiO_2$ pastes heated to a suitable temperature. The ion beams were accelerated in a two-section tube connected with a d-c source. The resulting cross section values are tabulated. The cross sections increase with energy in the entire range. (B.J.H.)

7348 AEC-tr-2714
VELOCITY DEPENDENCE OF LITHIUM ION CHARGE. M. I. Kuznetsov, P. I. Lukirskii (Lukirsky), and N. A. Perrilov. Translated from Doklady Akad. Nauk S.S.S.R. 100, 665-7(1955). 4p.

An experimental study was made of the change of charge as a function of ion velocity for the fast Li^8 ions produced in thick Ilford C_2 emulsions by nuclear disintegration. The methods used to study this process are outlined. Relationships were established between darkening and energy loss, and from these relationships, a determination was made of the range-energy curve for Li ions. These relationships are shown in graphical and tabular form. (B.J.H.)

7349 AEC-tr-2745
SINGLE SCATTERING OF STRIPPED ARGON IONS. D. M. Kaminker and N. V. Fedorenko. Translated from

Zhur. Tekh. Fiz. 25, 2239-55(1955). 16p.

The primary beam consisted of singly-charged argon ions with energies from 40 to 150 kev. In connection with single collisions of A^+ ions with argon atoms investigations were made of the angular distributions for: 1) A^+ scattered without change of charge; 2) fast A^{2+}, A^{3+}, A^{4+}, and A^{5+} ions produced through stripping (the processes $A^+ \rightarrow A^{2+}$, $A^+ \rightarrow A^{3+}$, $A^+ \rightarrow A^{4+}$, $A^+ \rightarrow A^{5+}$); and 3) fast neutral atoms produced by resonant charge exchange ($A^+ \rightarrow A^0$). Measurements were made up to 15° from the direction of the primary beam. A general method was developed for calculating the absolute differential scattering sections for charge exchange $d\sigma/d\omega$ at all angles including $\theta = 0°$. It was found that charge exchange as well as scattering without change of charge take place principally at small angles. At large angles stripping predominates. The curves $d\sigma/d\omega = f(\theta)$ for scattering with stripping show a central maximum at $\theta = 0°$ and a second, shifted peak. The angle of the second peak increases with increase of the stripping order and with decrease of the initial ion energy. On the basis of the angular distribution curves the integral cross sections for stripping were calculated. At initial ion energy T = 75 kev: $\sigma_{1-2} \simeq 1.4 \cdot 10^{-16}$, $\sigma_{1-3} \simeq 2.5 \cdot 10^{-17}$, $\sigma_{1-4} \simeq 6.0 \cdot 10^{-18}$, $\sigma_{1-5} \simeq 1.8 \cdot 10^{-18}$ cm^2. Scattering with stripping for $A^+ \rightarrow A^+$ was also investigated in helium, neon and krypton. (auth)

7350 AEC-tr-2748

ON THE SPREADING OF INTENSE BEAMS OF CHARGED PARTICLES. M. D. Gabovich. Translated from Zhur. Tekh. Fiz. 25, 1458-61(1955). 4p.

The spreading of a charged particle beam with a circular cross section under the influence of its own space charge is briefly discussed. Equations are developed for the current density limit in beams that results from the spreading effect. (B.J.H.)

7351

BACKSCATTERING FROM DIELECTRIC-COATED INFINITE CYLINDRICAL OBSTACLES. Charles C. H. Tang (Harvard Univ., Cambridge, Mass.). J. Appl. Phys. 28, 628-33(1957) May.

The electromagnetic backscattering properties of an infinite conducting cylinder coated with a lossless dielectric layer of thickness comparable to a wavelength is investigated both theoretically and experimentally. The theoretical problem is first formulated with three regions of arbitrary constants and then reduced to the specific cases. The experimental investigation utilizes the parallel-plate-region technique modified to permit the application of the Doppler shift principle. The scattering obstacle is set in motion in the presence of a plane-wave electromagnetic field in the parallel-plate region, and the detected Doppler signal is directly proportional to the backscattered field of the obstacle in question. The theoretical and experimental results are in excellent agreement. (auth)

7352

THE INELASTIC SCATTERING OF PROTONS AND NEUTRONS BY DEFORMED NUCLEI. D. M. Brink (Clarendon Lab., Oxford) and S. Yoshida (Univ. of Birmingham, Eng.). Nuovo cimento (10) 4, Suppl. No. 3, 1121-4(1956).

Two compound nucleus theories for neutron inelastic scattering, the black nucleus model and the optical model, are compared with the direct interaction theory. The predictions of cross sections of the theories are compared with experimental data when available. Some agreement is found for the direct theory, but the calculation is not yet finished. (M.H.R.)

7353

THE FIRST PASSAGE PROBLEM IN THE THEORY OF MULTIPLE SCATTERING. J. C. Barton (Univ. Coll. of West Indies). Proc. Phys. Soc. (London) A70, 253-61(1957) Apr.

A new formal method of solving first passage problems is developed and applied to the multiple scattering equation for the simplest cases of single- and double-sided boundaries. The latter problem is also treated by an alternative method which enables the moments of the distribution to be calculated more readily. (auth)

7354

INELASTIC COLLISIONS BETWEEN HEAVY PARTICLES. VII. ELECTRON LOSS FROM FAST HYDROGEN ATOMS PASSING THROUGH HELIUM. D. R. Bates and A. Williams (Queen's Univ. of Belfast). Proc. Phys. Soc. (London) A70, 306-9(1957) Apr.

Born's approximation to electron loss processes was applied. The calculated total loss cross section and the contribution from the single-transition process were plotted against the energy of the incident hydrogen atom, using a double logarithmic scale. For comparison the results of measurements of electron loss from hydrogen atoms in atomic hydrogen are similarly plotted. Above about 100 kev, the agreement is satisfactory, but, below, it is poor, the theoretical cross sections being much smaller than the experimental. (M.H.R.)

7355

LIGHT OUTPUT OF POTASSIUM IODIDE CRYSTALS UNDER BOMBARDMENT BY CARBON IONS. W. E. Burcham (Univ. of Birmingham, Eng.). Proc. Phys. Soc. (London) A70, 309-13(1957) Apr.

The dependence of the light pulse produced by a heavy ion in an alkali halide on ion energy was studied using C^{12} ions in KI(Tl). The pulse-height and crystal response are graphed and compared to results using α particles. For carbon ion energies between 70 and 113 Mev the light output is linear with energy. Observations below 70 Mev are not sufficiently accurate to establish linearity. Below 10 Mev the average charge decreases rapidly with velocity and a closer study of the response curve may exhibit the importance of nuclear stopping collisions. (M.H.R.)

7356

THE THEORY OF γ-RAY MULTIPLE SCATTERING. V. S. Galishev, V. I. Ogievetskii, and A. N. Orlov. Uspekhi Fiz. Nauk 61, 161-216(1957) Feb. (In Russian)

A systematic review of calculations for multiple scattering of 0.05- to 10-Mev γ quanta are presented. The general regularities of γ-ray attenuation in thick absorbers were determined and the spatial expansion and γ emission energy spectrum for all practical problems were calculated. (R.V.J.)

Refer also to abstract 7236.

RADIATION EFFECTS

7357 NAVORD-2381

Naval Ordnance Lab., White Oak, Md.

EFFECT OF NUCLEAR IRRADIATION ON MAGNETIC PROPERTIES OF CORE MATERIALS. R. S. Sery, R. E. Fischell, and D. I. Gordon. Dec. 19, 1956. 49p.

An investigation was made of radiation effects on the magnetic characteristics of seven representative core materials. The materials were irradiated in the BNL reactor for approximately 17 days at a neutron flux of 1.8×10^{12} $n/cm^2/sec$. The total integrated flux for this period was 2.7×10^{18} $n/cm^2/sec$. Magnetic measurements were made before, during, and after irradiation. (auth)

7358 NYO-7826

Carnegie Inst. of Tech., Pittsburgh.

RADIATION EFFECTS IN SOLIDS. Annual Report for

July 1, 1956–July 1, 1957. Dept. of Physics. R. Smoluchowski, R. H. Chambers, W. Goldburg, J. Hall, H. S. Ingham, K. Kobayashi, M. Merriam, P. V. Mitchell, F. M. Ryan, and D. A. Wiegand. Apr. 26, 1957. 8p. Contract AT(30-1)-1193. $0.15(OTS).

Greatly improved conductivity equipment allows measurements down to room temperature. Isothermal annealing of irradiated KCl indicates an increase of resistivity in accord with the proposed model of clustering of defects. Density changes remain constant up to about 200°C and then decrease rapidly. This correlates with the disappearance of R′ bands. Facilities for low temperature proton, x-ray, and gamma irradiation have been built. A search for an evidence of the existence of "incipient" F centers at dislocation jogs gave no positive answer. Energy dependence of F center formation has been measured and found to be in accord with theory. No significant surface effects have been found. Special crystals for measurement of elastic constants have been irradiated. Photoelastic measurements and nuclear magnetic resonance equipment has been assembled and constructed. (auth)

7359 USNRDL-TR-135

Naval Radiological Defense Lab., San Francisco. THERMAL RADIATION DAMAGE TO CELLULOSIC MATERIALS. PART II. IGNITION OF ALPHA CELLULOSE BY SQUARE-WAVE EXPOSURE. C. P. Butler, S. B. Martin, and W. Lai. Nov. 26, 1956. 93p. Project NS 081-001. (AFSWP-906).

7360 WADC-TR-55-58(Pt. III)

Goodrich (B. F.) Co. Research Center, Brecksville, Ohio. A STUDY OF THE EFFECTS OF NUCLEAR RADIATIONS ON ELASTOMERIC COMPOUNDS AND COMPOUNDING MATERIALS. [Period Covered]: January 1, 1956 to December 31, 1956. John W. Born, Dwain E. Diller, and Eugene H. Rowe. Dec. 1956. 54p. Project title: ANPP DEVELOPMENT SUPPORT PROJECT. Task title: RADIATION EFFECTS. Contract AF33(616)-2308.

Research followed four main lines: the development of Anti-Rads to prevent radiation damage; infrared and mass spectral analyses to relate radiation stability to molecular structures of elastomers; stress relaxation studies to define the mechanisms of radiation damage; and measurements of dynamic mechanical properties of representative rubber compounds after irradiation. Emphasis upon applied testing of end-item materials increased. The best Anti-Rad extended the retention of tensile strength and ultimate elongation by natural rubber tread stock more than tenfold. The screening study is providing criteria for the selection of superior Anti-Rads. A new technique of mass spectral analysis promises to aid greatly in determining what molecular structural features impart radiation stability. Stress relaxation measurements detail the important role of oxygen in radiation damage. Dynamic test data are given for eight representative rubber compounds. (See also WADC-TR-55-58(Pt. II.) (auth)

7361 WAPD-160

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. THE EFFECT OF IRRADIATION ON THE PROPERTIES OF BORON–STAINLESS STEEL POWDER DISPERSION SAMPLES. J. D. Eichenberg. Jan. 2, 1957. 27p. Contract AT-11-1-GEN-14. $0.25(OTS).

Impact and tensile specimens of 1 wt. % B^{10}-SS, 2 wt. % B^{10}-SS, and 5 wt. % B^{N}-SS powder dispersion samples were irradiated to a maximum unperturbed exposure of 1×10^{21} nvt. No gross dimensional change or warpage was produced as a result of the irradiation, and no changes were evident in the microstructure of the samples. The hardness of all the samples increased approximately 175 DPH units and was not dependent on exposure. The results of the tensile and impact tests indicated that the samples were almost completely embrittled as a result of the irradiation, even at unperturbed exposures as low as 0.8×10^{20} nvt. (auth)

7362

THE EFFECT OF RADIATION DAMAGE ON THE ELECTRONIC PROPERTIES OF SOLIDS. E. W. J. Mitchell (Univ. of Reading). Brit. J. Appl. Phys. 8, 179-89(1957) May.

An outline is given of the way in which the concentration of defects introduced by irradiation may be estimated. The topics which are discussed are the effects of irradiation on the electron mobility in metals, the carrier concentration in germanium and the optical absorption in quartz and diamond. The emphasis in the discussion of results is on their contribution to the study of defects in solids. (auth)

7363

RADIATION EFFECT OF POSITIVE ION BOMBARDMENT ON GLASS. R. L. Hines (Ford Motor Co., Dearborn, Mich.). J. Appl. Phys. 28, 587-91(1957) May.

Bombardment of a silica-soda-lime glass (n_D = 1.5246) by more than 5×10^{16} A^+ ions/cm^2 with an energy of 33.5 kev reduces the reflection coefficient to 0.36 of its normal value for light of wavelength $\lambda = 0.6\ \mu$. The change in reflection coefficient is attributed to the formation of an altered glass layer. For a bombardment by 40-kev A^+ ions, the layer has a thickness of 0.095 μ and an effective refractive index of 1.343. The depth of the layer is determined by the ion energy and agrees approximately with the theoretical range of the incident ions. The refractive index of the altered layer is determined by the integrated flux of positive ions and the type of ion. The magnitude of the positive ion flux employed here is shown to be orders of magnitude larger than the flux of primary "knocked-on" atoms produced by fast neutron bombardment in a reactor. (auth)

7364

FAST NEUTRON EFFECTS IN TETRAGONAL BARIUM TITANATE. M. C. Wittels and F. A. Sherrill (Oak Ridge National Lab., Tenn.). J. Appl. Phys. 28, 606-9(1957) May.

Tetragonal $BaTiO_3$ is transformed into cubic $BaTiO_3$ as a result of irradiation with fast neutrons at a temperature of approximately 100°C. Sufficient atomic displacements are produced by bombardment with an integrated fast neutron flux of 1.8×10^{20} n/cm^2 so that tetragonal single crystals (c_0 = 4.0349 A and a_0 = 3.9923 A) expand anisotropically to form perovskite-type cubic single crystals with a_0 = 4.0824 A. The irradiated material remains cubic to the lowest temperature of measurement, 78°K, showing none of the low temperature phase transitions of unirradiated $BaTiO_3$, and after annealing at 1000°C the crystal remains cubic but with a reduced lattice parameter. X-ray, thermal, and optical methods were employed in studying these effects. (auth)

7365

EFFECTS OF IRRADIATION UPON DIODES OF THE SILICON JUNCTION TYPE. R. Gorton (E.M.I. Engineering Development, Ltd., Feltham, Middlesex). Nature 179, 864 (1957) Apr. 27.

7366

THE DISPLACEMENT OF ATOMS IN SOLIDS BY RADIATION. T. M. Fry (Atomic Energy Research Establishment, Harwell, Eng.). Nuovo cimento (10) 4, Suppl. No. 3, 1329-34(1956).

Experiments performed on metals to investigate the influence of irradiation on structure-sensitive properties are reviewed. Ways in which the lattice can recover its initial degree of perfection are discussed. (M.H.R.)

SHIELDING

7367 SWP/P-23

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

SUGGESTED PROGRAMME OF WORK ON DUCT SHIELDING PROBLEMS. D. B. Halliday and C. C. Horton. May 16, 1955. Decl. Feb. 15, 1957. 6p.

Calculations of radiation streaming in ducts through a shield are briefly discussed, and suggested experiments on shield ducts are outlined. (B.J.H.)

SPECTROSCOPY

7368 AEC-tr-2709

A NEW EXTREMELY BRILLIANT HYDROGEN LAMP. I. I. Kondilenko and M. P. Lisitsa. Translated from Zhur. Tekh. Fiz. 25, 1316-22(1955). 6p.

The use of the hydrogen arc lamp as a source of continuous ultraviolet radiation is briefly discussed. A detailed description is given of a hydrogen arc lamp with a spherical cathode. Data are also included on its optical and electrical characteristics. (B.J.H.)

7369 AEC-tr-2719

SOME NEW DESIGNS OF APPARATUS FOR SPECTRUM ANALYSIS. L. M. Ivantsov and K. P. Krylov. Translated from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 5, 387-90 (1941). 4p.

Designs of two types of nonrecording photometers are included. The basic model has two characteristic attributes, use of a low power light source and an optical limiter for the operating height of photocell slit. The simplified model lacks the mechanical micrometric feed of the spectrogram and has a set of diaphragms instead of the precision photocell slit. This model affords the same degree of accuracy as the first but is simpler for mass production. A design for a prism stand is also given. Optical schematics for these designs are included. (M.H.R.)

7370 AEC-tr-2720

STABILIZATION OF SPECTRUM EXCITATION CONDITIONS IN THE ARC COLUMN. I. B. Velyakov-Bodin and S. L. Mandelshtam. Translated from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 5, 229-34(1941). 6p.

The conditions for stabilization of the excitation of the spectrum in the column of the arc are investigated. A phenomenon well-known in spectrum analysis by means of the Steeloscope, namely that the accuracy of determination of most elements and in the sensitivity of the determination of nickel is increased when the work is carried on with a direct current under a voltage of 220 v instead of with 120 v is explained on the basis of this investigation. The use of a source with an abruptly falling external characteristic is suggested. Data are cited concerning the stabilized rectifiers calculated and produced on the basis of these investigations by the "Burevestnik" Plant and the Scientific Research Institute of Cinematography Construction. The results of investigation of these rectifiers are set forth; they show the expected increase in the accuracy of the analyses and in the sensitivity of the determination of Ni, V, Mo and W. (auth)

7371 AEC-tr-2736

FABRY-PEROT INTERFEROMETER FOR RADIO WAVES IN THE MILLIMETER REGION. Translated from Uspekhi Fiz. Nauk 52, 173-8(1953). 6p.

7372 AEC-tr-2909

STUDIES ON THE RAMAN EFFECT. PAPER 60. POLARISATION MEASUREMENTS. I. METHOD. A. W. Reitz. Translated by E. L. Poole from Z. physik. Chem. 33B, 368-86(1936). 17p.

7373

ZEEMAN EFFECT ON THE QUADRUPOLE SPECTRA OF SODIUM, POTASSIUM, AND BARIUM CHLORATES. Henry Zeldes and Ralph Livingston (Oak Ridge National Lab., Tenn.). J. Chem. Phys. 26, 1102-6(1957) May.

All features of the Zeeman pattern of $NaClO_3$ that were examined can be deduced from the crystal symmetry and knowledge of the orientation of the crystal axes in the magnetic field. The crystal axes could be located with respect to the magnet goniometer to within 0.05° by observation of the Zeeman pattern. The line width was found to be 1.2 kc between flexes. A method was devised for orienting $KClO_3$ and $Ba(ClO_3)_2 \cdot H_2O$ crystals by attaching a $NaClO_3$ crystal and observing its Zeeman pattern. In $KClO_3$, the field gradient tensor asymmetry parameter η was found to be about 0.006 and the z-principal axis was located and compared with features of the structure. The line, one of the sharpest yet observed, measured 0.29 kc between flexes. In $Ba(ClO_3)_2 \cdot H_2O$, the upper limit for η was found to be 0.05. The z-principal axes were located and compared with features of the crystal structure. The line width was found to be about 3 kc. (auth)

THEORETICAL PHYSICS

7374 NYO-7886

Princeton Univ., N. J. Observatory.

MOTION OF MAGNETIC LINES OF FORCE. Technical Report No. 1. William A. Newcomb. Apr. 20, 1955. 73p. $12.30(ph OTS); $4.50(mf OTS).

It is often said that magnetic lines of force in a conducting fluid move with the fluid. In the case of a plasma, this means that the lines of force move with the particle drift velocity $\underline{v}_p = (\underline{E} \times \underline{H})/H^2$. Such statements are not directly verifiable, since the velocity of a line of force is not a measurable quantity. However, the statement that the lines of force move with a certain velocity $\underline{v}(\underline{r},t)$ does have verifiable consequences. It is permissible to ascribe a velocity $\underline{v}$ to the lines of force if and only if $\nabla \times (\underline{E} + \underline{v} \times \underline{H})$ vanishes identically. It is always possible to choose a $\underline{v}$ satisfying this relation, although it is not generally possible to do this uniquely. To say that a certain velocity $\underline{v}$ is permissible means that all the verifiable consequences of ascribing this velocity to the lines of force are valid, i.e., that $\underline{v}$ is flux-preserving. In the case of the particle drift velocity the condition for flux-preservation reduces to $\nabla \times [\underline{H}(\underline{E} \cdot \underline{H})/H^2] = 0$. Even if $\underline{v}_p$ is not flux-preserving, there may be some closed curves moving with velocity $\underline{v}_p$ which have constant flux. A semi-exhaustive enumeration of such curves is given for a general electromagnetic field. Among these curves are those which lie in a surface everywhere perpendicular to $\underline{H}$, if this surface is independent of time. A family of such surfaces will exist if and only if $\underline{H} \cdot \nabla \times \underline{H}$ and $\underline{H} \times \dot{\underline{H}}$ both vanish identically. A velocity may be line-preserving without being flux-preserving, but not vice versa. The necessary and sufficient condition for line-preservation is that $\underline{H} \times [\nabla \times (\underline{E} + \underline{v} \times \underline{H})]$ should vanish identically. The motion of the lines of force in a plasma is related only to the transverse motion of the charged particles. The latter is separable from the longitudinal motion if and only if $\underline{v}_p$ is line-preserving. A necessary and sufficient condition is also given for the separability of only one component of the transverse motion. The concept of a line of force is not relativistically covariant, because each point of a line of force has the same time coordinate. A curve in space-time which appears as a line of force in one frame of reference will therefore not be a line of force in another frame of reference. However, a moving line of force will trace out a two-dimensional surface in space-time, and it may be that this surface will intersect every

space-like hyperplane in a line of force. In that case the surface will appear as the path of a moving line of force in every frame of reference, thus defining a moving line of force as a covariant concept. It is shown that a family of such surfaces exists if and only if $\underline{E} \cdot \underline{H}$ vanishes identically, in which case they will be generated by lines of force moving with the particle drift velocity $\underline{v}_p$. (auth)

7375 AEC-tr-2713
ENERGY LOSS OF CHARGED PARTICLES MOVING THROUGH AN ANISOTROPIC MEDIUM. A. G. Sitenko and M. I. Kaganov. Translated from Doklady Akad. Nauk S.S.S.R. 100, 681-3(1955). 5p.

It is shown that a consistent calculation of the total energy loss of charged particles moving through an anisotropic medium does not result in a divergent expression. (M.H.R.)

7376 AEC-tr-2716
ON THE THEORY OF OSCILLATIONS OF INTERACTING ELECTRON CURRENTS. Yu. K. Bergner. Translated from Doklady Akad. Nauk S.S.S.R. 78, 435-8(1951). 6p.

7377 AEC-tr-2742
SOME RESULTS IN RELATIVISTIC MAGNETOHYDRODYNAMICS. K. P. Stanyukovich. Translated from Doklady Akad. Nauk S.S.S.R. 103, 73-6(1955). 5p.

The case of one-dimensional motion of a gas in a magnetic field was studied for various values of the parameters. All equations of the usual one-dimensional relativistic gas dynamics are shown to be valid for this case. (M.H.R.)

7378 AEC-tr-2752
THE INTERACTION OF EXTRAORDINARY AND ORDINARY WAVES IN THE IONOSPHERE AND THE EFFECT OF MULTIPLICATION OF REFLECTED SIGNALS. N. G. Denisov. Translated from Zhur. Eksptl. i Teoret. Fiz. 29, 380-1(1955). 3p.

7379 AEC-tr-2754
WAVES IN A GYROTROPIC MEDIUM. M. A. Gintsburg. Translated from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 18, 444-55(1954). 14p.

Discussions on propagation of an electromagnetic wave in a plane gyrotropic layer, the space-time analogy between waves in a gyrotropic medium and oscillations of coupled systems, a gyrotropic waveguide, excitation of a gyrotropic waveguide, and a wave guide with ferrite in a transverse field H_0 are included. (M.H.R.)

7380
DIMENSIONALITY OF CHARGE SPACE. D. C. Peaslee (Univ. of California, Berkeley). Nuovo cimento (10) 4, 1583-4(1956) Dec.

Various hypotheses attributing dimensions to the charge space of heavy particles are reviewed. Evidences for four-, five-, six-, and n-dimensional space are given. (M.H.R.)

7381
THE NON-LOCAL AND NON-LINEAR FIELD THEORY. D. I. Blokhintsev. Uspekhi Fiz. Nauk 61, 137-59(1957) Feb. (In Russian)

The non-local and non-linear field theory and the physics of strong interactions are analyzed. The limitations of the particle theory in quantum dynamics are discussed. (R.V.J.)

URANIUM AND URANIUM COMPOUNDS

7382 BNL-3201
Brookhaven National Lab., Upton, N. Y.
THE SPONTANEOUS NEUTRON YIELD OF NATURAL URANIUM. Serial Report No. 7 on Startup Experiments. R. S. Margulies. Sept. 4, 1951. Decl. Nov. 7, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

A mathematical formulation for the spontaneous neutron yield of natural uranium was made. This formulation was compared with experimental data, and the results were graphed. (M.H.R.)

7383 KAPL-1668
Knolls Atomic Power Lab., Schenectady, N. Y.
ELECTROWINNING OF URANIUM FROM ITS OXIDES. II. A PRELIMINARY ENGINEERING EVALUATION. L. W. Niedrach and A. C. Schafer. Apr. 3, 1957. 32p. Contract W-31-109-Eng-52. $0.25(OTS).

A preliminary estimate was made of the cost of reducing UO_2 to metal by an electro-reduction method similar to the Hall process for Al. Based upon a production rate of 10 tons of metal per day operating costs of $0.332/lb of U were found. Amortization of plant facilities in five years will add $0.195/lb to this cost. If a 25% profit before taxes is desired an additional $0.129 must be added. The total plant investment is $7,850,000. (auth)

7384 WAPD-173
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
RELEASE OF FISSION GASES FROM UO_2. B. Lustman. Mar. 1957. 29p. Contract AT-11-1-GEN-14. $0.25 (OTS).

The available data on release of fission gases from irradiated uranium oxide were correlated on the basis of a diffusional mechanism of gas mobility in the oxide. The diffusion rates thus estimated were found to vary with temperature and had an activation energy similar to that observed in case of the diffusion of oxygen in UO_2. The frequency factor, however, was found to be six orders of magnitude less than that observed for oxygen diffusion. The amounts of fission gas released in experimental fuel rods were found to agree within a factor of 3 with those predicted by such a diffusional mechanism when correction was made for the open porosity or density of the oxide bodies. The pressures and strains developed within fuel rods of the PWR Core 1 configuration and in experimental flat plate fuel elements were calculated for various burnups and burnup rates. The conclusions drawn from this investigation are that the release of fission gases from irradiated UO_2 is in all probability controlled by diffusion of the gases from the oxide matrix, the oxide density is important in establishing the path length for diffusion to external surfaces, the PWR Core 1 blanket fuel element geometry is considered safe with respect to the internal pressures and cladding strains developed to burnups and burnup rates far in excess of those proposed in PWR Core 1, and compartmented flat plate configurations are considered feasible for both seed and blanket fuel elements from the points of view of internal pressures and cladding strains. (auth)

PATENTS

CHEMISTRY

7385
EXTRACTION OF NIOBIUM. J. M. Fletcher, D. F. C. Morris, and A. G. Wain (to U. K. Atomic Energy Authority). British Patent 767,038. Nuclear Eng. 2, 224(1957) May.

Ferroniobium or crushed niobium-bearing mineral concentrate is dissolved in a mixture of hydrofluoric acid and nitric acid. The solution is contacted with equal volumes of 100% tributyl phosphate in a continuous extractor, the ex-

tract collected and backwashed with aqueous hydrofluoric acid. Ammonia gas is passed through the backwash until precipitation of the niobic acid appears to be complete. When using sulfuric acid in the mixture, batch extraction is preferable. (auth)

7386

SEPARATION OF NIOBIUM FROM TANTALUM. P. G. England and I. S. Broadley (to U. K. Atomic Energy Authority). British Patent 767,135. Nuclear Eng. 2, 224 (1957) May.

Niobium and tantalum occur together in nature and have similar chemical properties. This renders separation difficult. It has now been observed that niobium pentachloride is more readily reduced to the trichloride than tantalum pentachloride. The pentachlorides of niobium and tantalum are formed by chlorination, the mixed pentachlorides treated with a reducing agent, then the tantalum pentachloride is removed by volatilization. (auth)

7387

SEPARATION OF NICKEL FROM COBALT. M. de Merre (to Soc. Gén. Métallurgique de Hoboken). British Patent 767,156. Nuclear Eng. 2, 224(1957) May.

Nickel is precipitated in metal form from a primary solution (with adjusted pH) of nickel and cobalt in the weight ratio Ni/Co greater than 2:1 as sulfates or chlorides by the action of a reducing gas under a superatmospheric pressure and a temperature above 100°C. The reduction is stopped while the precipitate contains less than 2 parts (by weight) of cobalt per 100 parts of nickel. The solution obtained after separation of the precipitate is then treated in a manner known. (B.P. 683,679; 650,595; 655,149). (auth)

7388

RECOVERY OF URANIUM VALUES FROM WASTE MATERIAL. (to U. K. Atomic Energy Authority (U.S.A.)). British Patent 768,831. Nuclear Eng. 2, 224(1957) May.

The material is hydrofluorinated to convert metal values to non-volatile fluorides. The residue is reacted with fluorine gas (at 400 to 500°C) forming uranium hexafluoride vapors which may be separately condensed. The process can be used for recovering uranium from sweepings, metal pieces (bolts, nuts) copper or other metallic parts of the isotope separating apparatus, etc. Fluorination is carried out on trays in a chamber constructed of fluorine resistant material (nickel, Monel metal) in the form of a muffle furnace into which hydrofluoric acid, fluorine and an inert gas (nitrogen, helium) are introduced as required. The inert gas is used for flushing between the treatment with acid and the treatment with fluorine. (auth)

ENGINEERING

7389

PUMPS. H. F. Parker (to U. K. Atomic Energy Authority). British Patent 767,339. Nuclear Eng. 2, 224(1957) May.

A pump designed for pumping toxic fluids from one tank to another is described. The pump can be adapted as a borehole pump or for immersion into a tank. A detailed description is given and a diagram is included. (M.H.R.)

7390

PUMP-MOTOR COMBINATIONS. J. C. Mansfield (to Hayward Tyler and Co., Ltd.). British Patent 768,833. Nuclear Eng. 2, 224(1957) May.

The liquid being pumped has free access throughout the casing enclosing the submersible motor and the pump. Between the pump and the motor within the casing there is a flameproof gap. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

7391

CORROSION-RESISTANT FIBROUS WEB OR FABRIC. D. Deverell and N. C. W. Judd (to U. K. Atomic Energy Authority). British Patent 766,841. Nuclear Eng. 2, 224 (1957) May.

A web or fabric of glass or mineral fibers is impregnated with a dispersion of polytetrafluorethylene in a volatilizable liquid and heated to remove the liquid by evaporation. It is then subjected to pressure (5 ton/sq in.) at an elevated temperature (300°C) below the sintering temperature of the polytetrafluorethylene. After repeating the steps at least once, the web or fabric is thus heated to sintering temperature. The process may be made continuous by running the cloth through a series of stages (baths and chambers). For low-pressure pump diaphragms, laminated board, parts of chemical plant, tubular and other bodies (shaped before sintering). (auth)

7392

CERAMIC MATERIALS. W. G. O'Driscoll and W. E. Dennis (to U. K. Atomic Energy Authority). British Patent 766,885. Nuclear Eng. 2, 224(1957) May.

In the reduction of metal fluorides with calcium, magnesium or other metal capable of displacing the metals, calcium fluoride lined vessels have been employed. The usual preparation of such linings by packing around a former, vibration to settle the mass, firing and sintering results in a large proportion (50%) of rejects owing to cracking during heating or handling. This disadvantage has been overcome by incorporating in an alkali earth metal fluoride a proportion (up to 5%) of an alkali metal fluoride or another alkaline earth metal fluoride which forms a lower melting point eutectic with the alkaline earth metal fluoride. The mixture is shaped (vessel lining, crucible), heated and sintered. (auth)

7393

ZIRCONIUM ALLOYS. D. E. Thomas, K. M. Goldman, R. B. Gordon, and W. A. Johnson (U.S.A.). British Patent 767,892. Nuclear Eng. 2, 224(1957) May.

A zirconium alloy containing tin (0.5 to 2.5%) and at least one metal from the group iron, nickel, chromium (not exceeding 2%) added to the zirconium to a maximum of 3% with less than 0.5% impurities is highly resistant to corrosion and may be readily hot and cold worked or wrought to strips, sheets and the like. The zirconium may have a hafnium content of up to 3%. By varying the tin content within the range of 0.5% and 1.5% the mechanical properties of the alloy may be adapted to the desired purpose without any significant change in its corrosion properties. (auth)

7394

LEACHING URANIUM FROM SULPHIDIC MATERIALS. F. A. Forward and J. Halpern (to Canadian Patents and Development, Ltd.). British Patent 768,282. Nuclear Eng. 2, 224(1957) May.

Hydrometallurgical methods for extruding uranium values from uranium bearing ores and concentrates have the disadvantage that they cannot be employed where the starting material contains sulfur or sulfides. The consumption of leaching agents through reaction with the sulfides is excessive, the presence of metal sulfides results in excessive consumption of precipitation reagents and makes recovery of a high-grade uranium product difficult and, in certain cases, the result is too low for economic recovery. Now it has been found that the presence of sulfides in uranium can be employed with advantage for a novel method of extracting uranium values. Sulfur, when associated with the origi-

nal uranium-bearing material as a mineral sulfide or as elemental sulfur, reacts with water in the presence of oxygen, oxygen enriched air or air alone to generate sulfuric acid. Under certain conditions, uranium values are rapidly dissolved in the leach solution with a high degree of extractive efficiency. The only reagents required (in the simplest form of the process) are the original uranium-bearing material, mineral sulfides or elemental sulfur, water and air. First a slurry is formed of the ingredients to produce a leach solution of a certain pH in a certain aqueous medium. Then the pulp mixture is heated in a reaction vessel to between 80 and 200°C. Sufficient oxygen is fed into the vessel to maintain a partial pressure of oxygen above 2 lb/sq in. and the oxidation reaction continued to dissolve the uranium values. Finally the leach solution containing those values is separated from the undissolved residue. (auth)

PHYSICS

7395

A NEW APPARATUS FOR PRODUCING AN ELECTRIC CURRENT. H. V. Colman and R. W. D. Seddon-Gillespie. British Patent 763,062. June 22, 1953. Nuclear Power 2, 212(1957) May.

This is a secondary battery operating by the release of electrical energy from certain elements when bombarded by UHF radio waves. In the application described there is a quartz tube mounted between the poles of an electromagnet. The tube is filled with a powdered mixture of compounds of Cd-112, P-31 and Co-59 which become radioactive and produce an electric current when treated with radio waves. The purpose of the magnet is to contain the alpha and beta particles which are produced in the reaction. Gamma activity is shielded by lead. One end of the quartz tube contains powdered zinc and the other, powdered copper. These form the electrodes. The ends of the tube are sealed by brass caps on which are mounted the receiving antennae and which also collect the current. The transmitter unit may be of any suitable type but is preferably crystal-controlled. The optimum energy release is obtained with a frequency of 300 mc/sec. It has been found that when fully charged with radioactivity the life of the battery is about one hour. When continuous operation is required, the transmitter has to be operated for about 15 to 30 secs every hour. With a quartz tube 45mm long and an inside diameter of 5mm and containing 30 mg of the mixture, the estimated output is 100 to 110 volts at 10 amps. It is claimed that the weight of the battery including shielding is only 25 per cent of that of any comparable known type of accumulator. The life of the mixture is said to be 70 to 80 years of constant use. (auth)

7396

PORTABLE SHIELDED CONTAINER FOR A RADIOACTIVE SOURCE OF RADIATION. S. Untermeyer (U.S.A.). British Patent 766,856. Nuclear Eng. 2, 224 (1957) May.

A radioactive capsule is arranged in a crooked or curved passage (stainless steel) in a shielding container (lead) and can be moved by a wire rod from an inactive position deep within the container to an operative position near the front of it. The capsule consists of an active core and a casing formed of a cup and a plug (both of aluminum). (auth)

7397

IMPROVEMENTS RELATING TO FUEL ROD ASSEMBLIES FOR NUCLEAR REACTORS. (to Atomic Energy of Canada Ltd.). British Patent 768,078. Mar. 31, 1954. Nuclear Power 2, 212(1957) May.

It has now been found that the cooling surface per unit of volume of the fuel, and hence the neutron flux obtainable, may be greatly increased with no resulting increased difficulty from deformation or from local overheating due to insufficient heat transfer from the fuel through the sheath. According to the invention the fuel is formed in thin strips, usually flat, which are enveloped in a tightly fitting thin pliable sheath of any of the usual sheathing metals, e.g. aluminum, zirconium or a zirconium-tin alloy or thin stainless steel. A plurality of these sheathed strips are arranged in a tube of circular cross-section in spaced parallel face-to-face relationship, each sheathed strip being of a width such that it is in contact with the tube along both its longitudinal edges. In this way passages are formed along each face of each sheathed strip for the circulation of heavy water. Means are provided for restraining longitudinal bending of the sheathed strips. These means may be either projections on the inner surface of the tube embracing each longitudinal edge of each sheathed strip or longitudinal fins extending from the surface of certain of the strips across all the passageways between strips. It has been found possible with a fuel rod assembly according to the present invention to obtain about seven times as high a neutron flux as is obtainable with a conventional assembly having the same volume of fuel. (auth)